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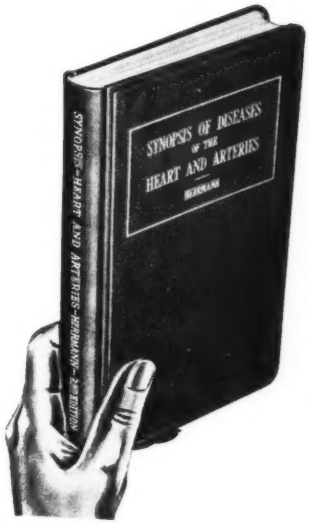

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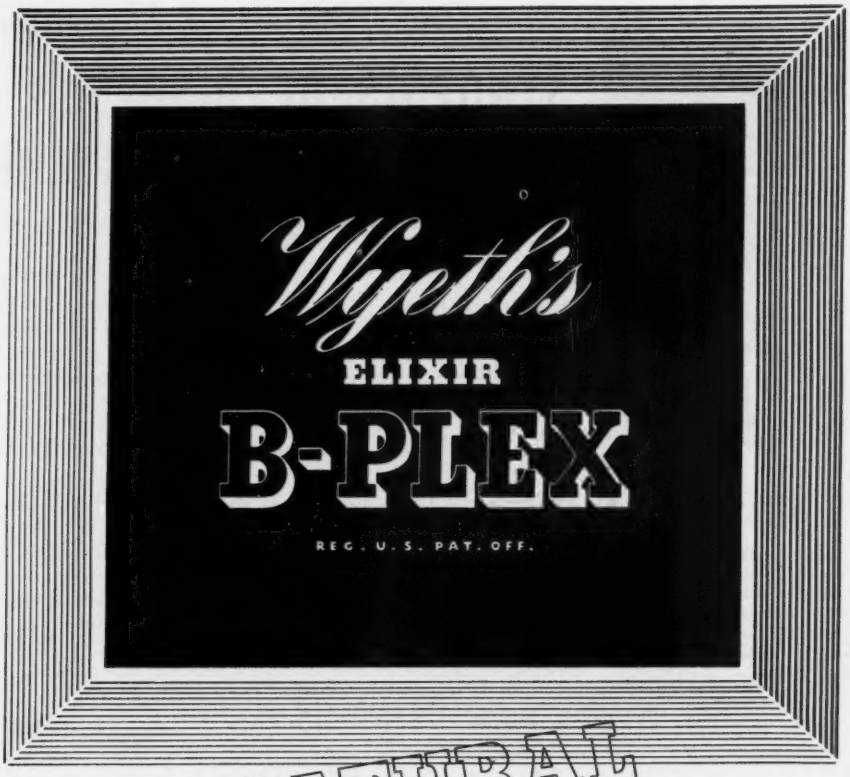

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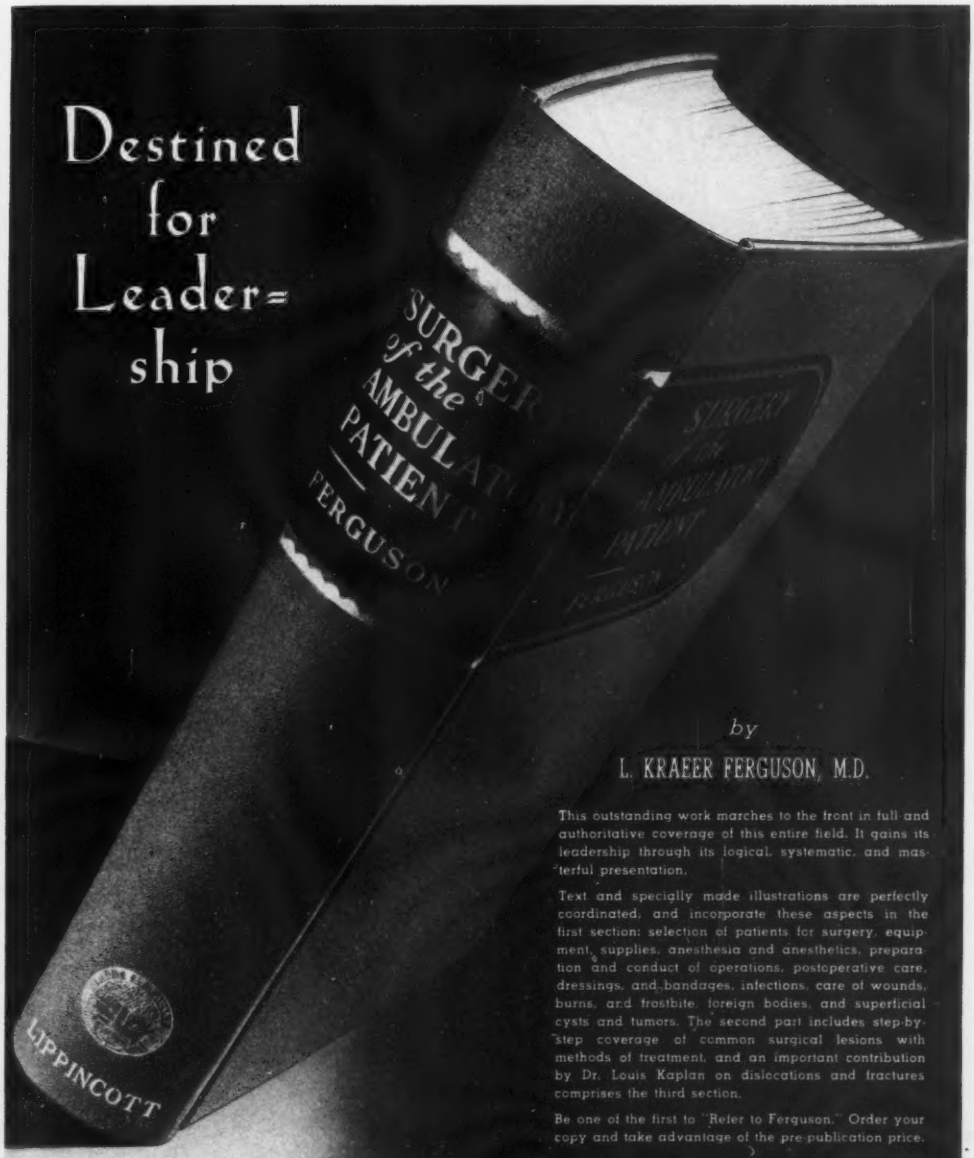

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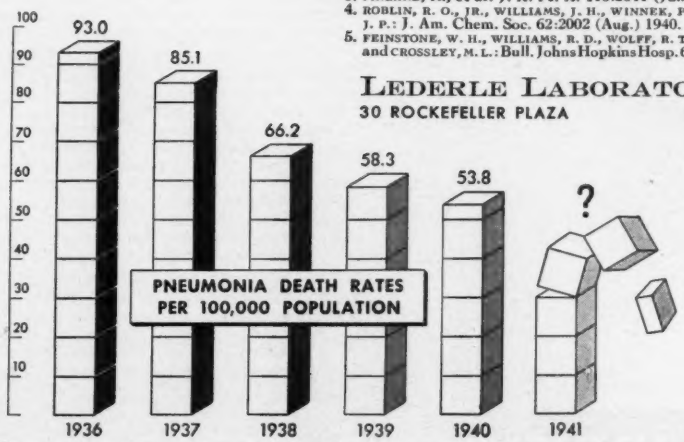

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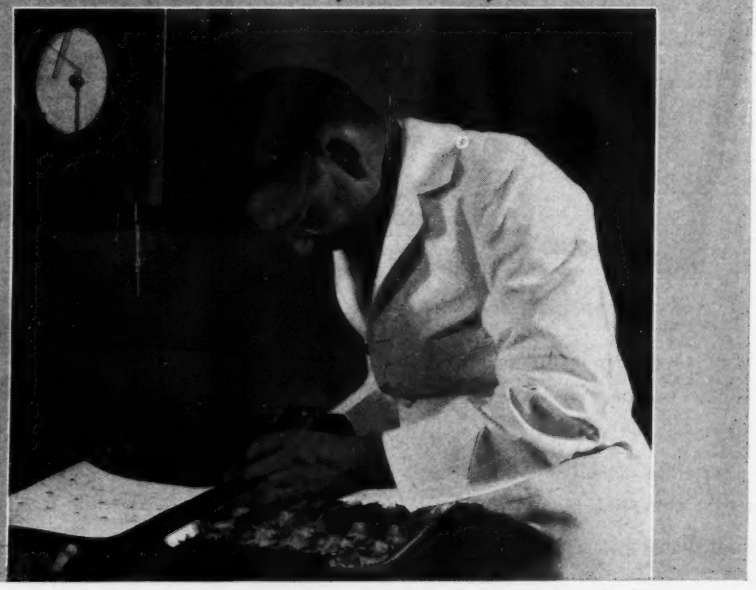

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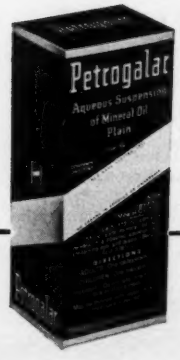

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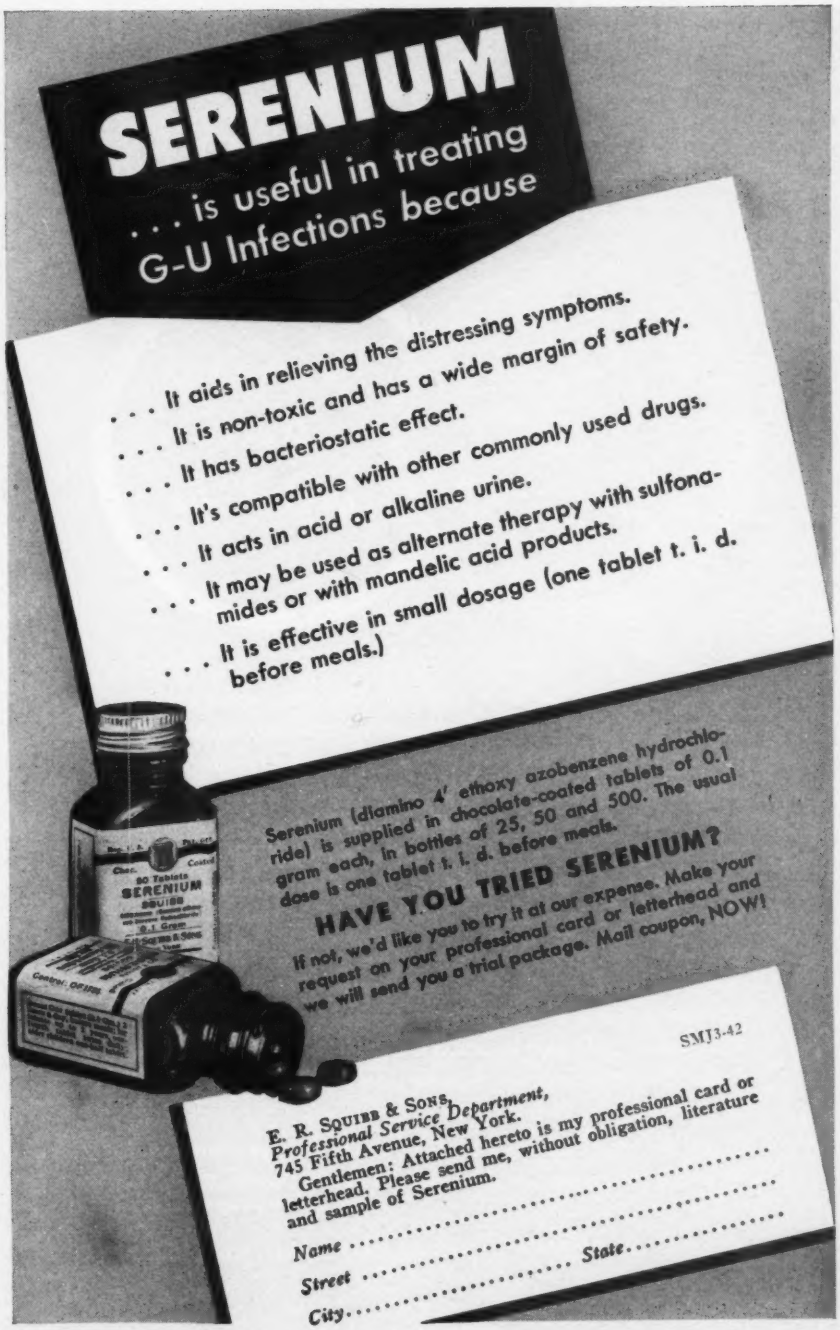
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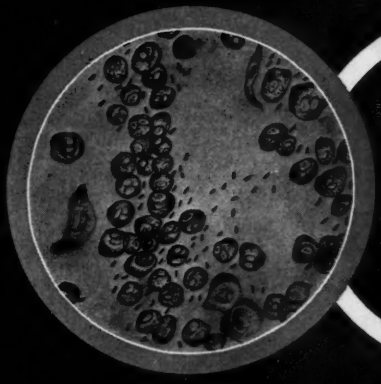

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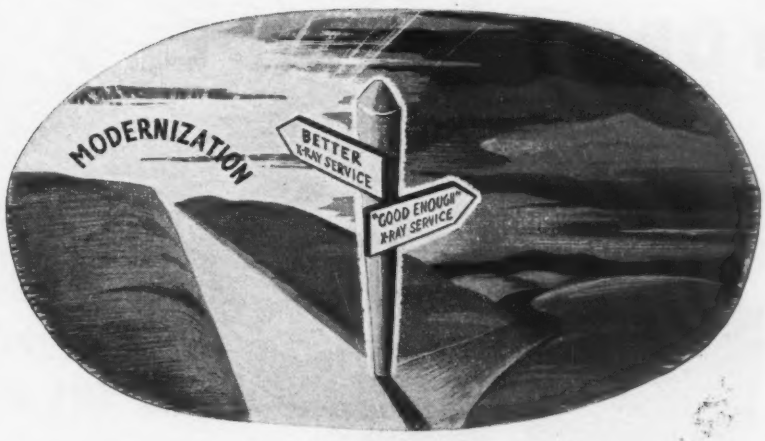

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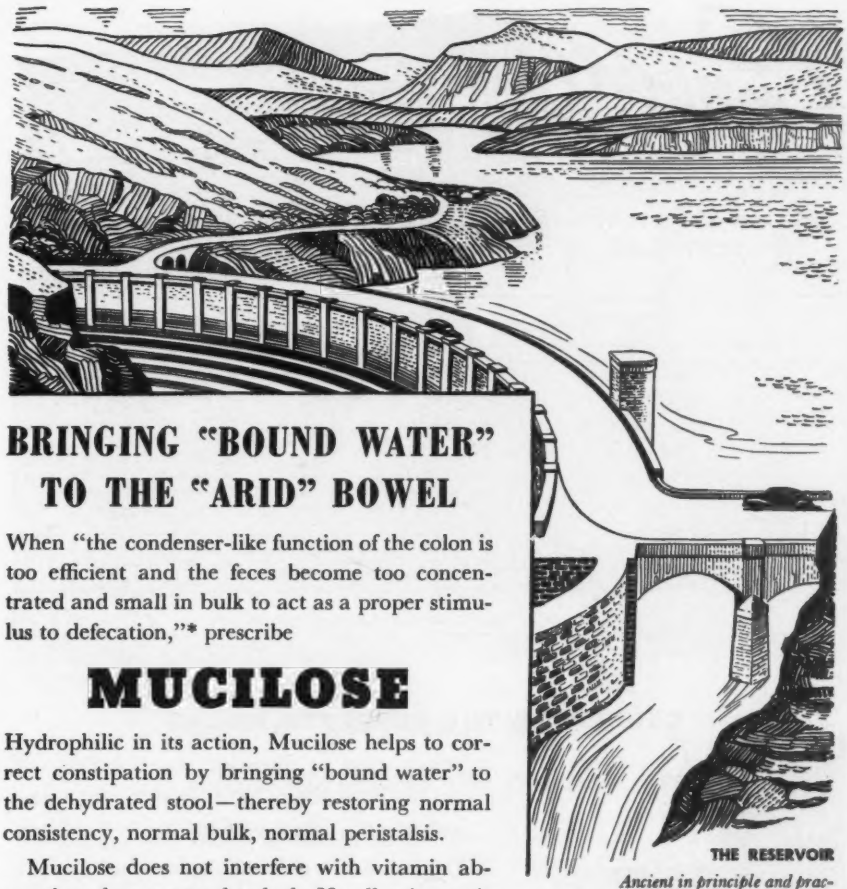
With the winter come colds and upper respiratory infections. To relieve the resulting nasal congestion, you will again need a reliable decongestant.

Racēphedrine Hydrochloride (Upjohn) is available as a 1% solution in Modified Ringer's Solution, in one ounce dropper bottles for prescription purposes, and in pint bottles for office use.

Upjohn
KALAMAZOO, MICHIGAN

Fine Pharmaceuticals Since 1886



BRINGING "BOUND WATER" TO THE "ARID" BOWEL

When "the condenser-like function of the colon is too efficient and the feces become too concentrated and small in bulk to act as a proper stimulus to defecation,"* prescribe

MUCILOSE

Hydrophilic in its action, Mucilose helps to correct constipation by bringing "bound water" to the dehydrated stool—thereby restoring normal consistency, normal bulk, normal peristalsis.

Mucilose does not interfere with vitamin absorption, does not tend to leak. No allergic manifestations have been observed from its use.

*Welch, P.B. and Kauders, F.H.; The Physiologic Approach to the Correction of Constipation.

THE RESERVOIR

Ancient in principle and practice—designed by man to augment Nature in maintaining a balance of water flow.

FREDERICK STEARNS & COMPANY, Detroit, Michigan

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Please send me a clinical supply of Mucilose.

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Compare

BARD-PARKER FORMALDEHYDE GERMICIDE

with any solution commonly used for the disinfection of surgical instruments...

1 AN EFFICIENT GERMICIDE

VEGETATIVE Test interval (minutes) producing sterility					SPORE Test interval (hours) producing sterility				
Test organism	PUS		BLOOD		Test organism	PUS		BLOOD	
	wet	dry	wet	dry		wet	dry	wet	dry
Staph. aureus	½	½	½	2	B. anthrasis	¼	¼	1	1
Strept. hemolyticus	½	½	½	*	Cl. tetani	18	18	18	18
Pseudomonas pyocyanea	½	½	½	1	Cl. welchii	1	2	4	4

*Controls negative—did not resist drying

2 CONSERVES THE BUDGETED DOLLAR

When used as directed, the Solution will not rust, corrode or otherwise damage steel instruments, glass or heat-treated rubber.

The Solution is non-injurious to the keen cutting edges of surgical knives and scissors, and delicate surgical instruments . . . thus serving to safeguard the surgeon's and hospital's instrument investment.

The Solution retains its high germicidal effectiveness over long periods of use if kept undiluted and free of foreign matter.

Ask your dealer

PARKER, WHITE & HEYL, INC.

DANBURY, CONNECTICUT

B-P

A BARD-PARKER PRODUCT

(Number two in a series of six.)

Common problems in the management of peptic ulcer

"What are you doing to obtain such rapid ulcer healing?"

X-ray examination demonstrates a decrease in the size of the ulcer in 10 days when Amphojel* is administered by the continuous intra-gastric drip. Pain is relieved in 8 to 24 hours.

Four striking features of Amphojel, Wyeth's Alumina Gel, are recognized by clinicians:

Amphojel provides prompt relief from pain. It permits rapid healing of the ulcer. It cannot be absorbed and eliminates the hazard of alkalosis. It reduces excess acidity without completely neutralizing the gastric contents.

" " "

Amphojel, Wyeth's Alumina Gel

Fluid Antacid . . . Adsorbent

One or two teaspoonfuls either undiluted or with a little water, to be taken five or six times daily, between meals and on retiring.

Supplied in 12-ounce bottles

AMPHOJEL

Wyeth's

Alumina Gel

For the Convenience of Ambulatory Patients

Wyeth's Hydrated Alumina Tablets

Antacid

One-half or one tablet in half a glass of water. Repeat five or six times daily, between meals and on retiring.

Supplied in boxes of 60 tablets

*Reg. U. S. Pat. Off.

JOHN WYETH AND BROTHER, INC., PHILADELPHIA, PA.

For Safe Salicylization in Colds and Influenza

Alysine

Natural salicylates in 1:2 ratio with selected alkaline salts.

Therapeutically rational, well-borne even in heroic dosage, Alysine offers a preferred method of salicylization in the treatment of respiratory affections and the arthritides.

ALYSINE and the Sulfonamides

Alysine is a valuable adjunctive medication to sulfanilamide and sulfathiazole in the treatment of influenza or la grippe. It provides a desirable alkaline factor, and helps relieve the muscular aches and pains that accompany most cases.

Dosage Forms:

Elixir Alysine: 5 grains natural salicylate per teaspoonful. 4-oz. and 16-oz. bottles.

Alysine Powder: 10 grains natural salicylates per teaspoonful. 1-oz. and 4-oz. bottles.

Alysine Effervescent Tablets: 10 grains natural salicylate per tablet. Bottles of 25.

Write for Literature and Sample of Elixir Alysine

T.M. "Alysine" reg. U. S. Pat. Off.

THE WM. S. MERRELL COMPANY

Founded 1828 • Cincinnati, U. S. A.

Furunculosis

due to Nutritional Imbalance

● A mild but protracted insufficiency of such essential nutritional elements as the hemopoietic principle and the vitamins of the B complex may produce a variety of troublesome symptoms. Susceptibility to infection may be increased and a tendency towards furunculosis result. There may be inflammatory or ulcerative lesions of the mucous membranes. The patient may complain of persistent but indefinite aches, malaise and lack of endurance.

In overcoming such manifestations, ARMOUR LIVER AND YEAST CONCENTRATE often proves most beneficial. This preparation contains the known hematopoietic and vitamin factors of both liver and yeast. The yeast before hydrolysis has been washed free from gastro-intestinal irritants. The hydrolyzing and stabilizing processes are so conducted that the liver odor and taste are eliminated while the anti-anemic properties, both primary and secondary, as well as the vitamin B complex of both liver and yeast are preserved. It is most valuable in combatting deficiencies of these elements, as an aid to convalescence, and as a nutritional adjuvant in pregnancy and post-partum.

The average dose is two teaspoonfuls twice daily—best administered in a little milk, water or fruit juice.

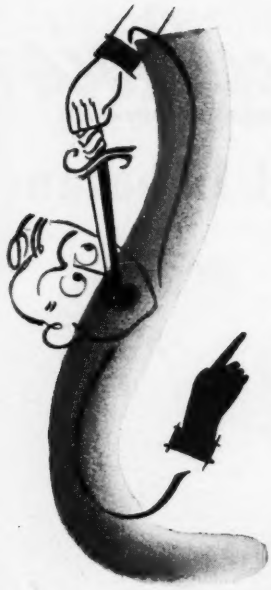
LIVER and YEAST CONCENTRATE

Armour

Have Confidence in the preparation you prescribe

Specify "ARMOUR"

THE *Armour* LABORATORIES, CHICAGO, ILLINOIS



A NEAT TRICK
if you can do it

On the other hand, Hematinic Plastules* the modern iron therapy, is exceptionally easy for the patient to take. Tasteless, odorless, these small, elastic capsules are easily swallowed. Only three Hematinic Plastules Plain daily, is the suggested dose.

Why not prescribe Hematinic Plastules, a convenient, effective and economical preparation, for iron deficiency and secondary anemia?

Bottles of 50, 100 and 1000

*Trade Mark Reg. U. S. Pat. Off.

THE BOVININE COMPANY
8134 McCORMICK BOULEVARD · CHICAGO, ILL

Hematinic Plastules **PLAIN or WITH LIVER CONCENTRATE**

These are the Reasons why we say "Try S-M-A"

- Physicians will find that S-M-A* is not a "compromise formula." It is a complete milk formula for infants deprived of human milk.
- Cows' milk fat is replaced with the unique S-M-A fat for easy digestion and adequate nutrition. It compares physically, chemically and biologically with the fat in human milk.
- The carbohydrates in S-M-A and human milk are identical.
- With the exception of vitamin C, the vitamins essential to normal growth and development (B_1, D, and A) are included in adequate proportion in S-M-A ready to feed.
- Furthermore, iron (so difficult to provide for the bottle-fed infant) is included in S-M-A. When prepared each quart provides 10 mg. iron and ammonium citrate.

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Excellent results with hundreds of thousands of infants is reason enough why S-M-A is the choice of a steadily increasing number of physicians.

Try S-M-A. Results tell the true story more aptly than words and pictures.

*S-M-A, a trade mark of S.M.A. Corporation, for its brand of food especially prepared for infant feeding—derived from tuberculin-tested cows' milk, the fat of which is replaced by animal and vegetable fats, including biologically tested cod liver oil; with the addition of milk sugar and potassium chloride; altogether forming an antirachitic food. When diluted according to directions, it is essentially similar to human milk in percentages of protein, fat, carbohydrate and ash, in chemical constants of the fat and physical properties.

S.M.A. CORPORATION • 8100 McCORMICK BOULEVARD • CHICAGO, ILLINOIS

Fluagel, because of its unique colloidal makeup, fixes more than 25 times its volume of N/10 HCl. One teaspoonful is thus capable of combining with the acids in 102 cc. of gastric juice.

Twice the Neutralizing Capacity . . .
More Sustained Action . . . Pleasingly Palatable . . .

FLUAGEL (Aluminum Hydroxide-Breon)

A unique research preparation, Fluagel possesses distinctive and exclusive advantages in the treatment of peptic ulcer.

Because of its higher concentration and the greater degree of dispersion of its colloidal particles, one teaspoonful (4 cc.) of Fluagel combines with at least 102 cc. of 0.36% hydrochloric acid (25 times its volume of N/10 HCl), leading to speedier relief of pain and exerting a more sustained action. Hence smaller doses and less frequent administration are needed, markedly simplifying the therapeutic regimen and making for economy.

Its astringent properties also contribute to more rapid healing. Fluagel does not lead to alkalosis, to chloride depletion, or to secondary acid rise. Its pleasing orange taste assures maximum patient cooperation, and its distinctive orange color makes for ready identification.

Average dose, 1 teaspoonful four times daily after meals and before bedtime. Supplied in 10 ounce wide-mouth jars.

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Pharmaceutical Chemists

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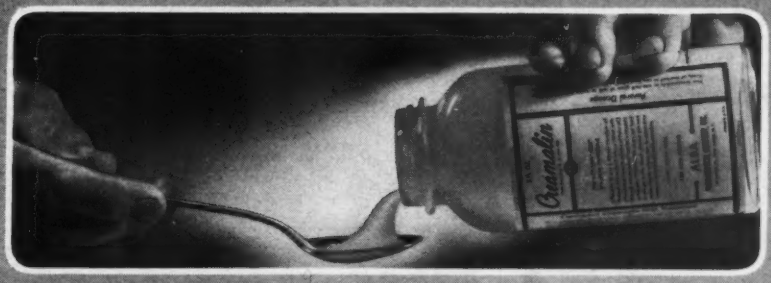
Creamalin

BRAND OF ALUMINUM HYDROXIDE GEL

earns its spurs

ACCEPTED AMERICAN MEDICAL ASSN.



CLIMAXING A 10-YEAR RECORD IN THE THERAPY OF PEPTIC ULCER AND GASTRIC HYPERACIDITY...

THE SEAL OF ACCEPTANCE of the Council on Pharmacy and Chemistry seems to the makers of CREAMALIN, the Alba Pharmaceutical Company, Inc., a most gratifying climax to a 10-year therapeutic record.

As the pioneer of aluminum hydroxide gels, CREAMALIN has been used throughout this experimental decade as the basis of extensive clinical research, and has proved itself as a therapy productive of convincing results in peptic ulcer, gastric hyperacidity, and symptomatic hyperchlorhydria.

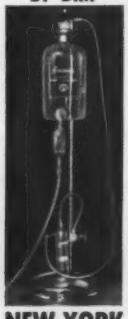
CREAMALIN contains approximately 5.5% aluminum hydroxide and is administered orally or, in more severe peptic ulcer cases, by the CREAMALIN automatic drip control.

WHAT THE 10-YEAR RECORD OF CREAMALIN SHOWS

- **Antacid action of 12 times its volume of N/10 HCl in less than 30 minutes (Toepfer's reagent).**
- **Sustained acid-combining action, unlike systemic alkalies.**
- **Non-alkaline; non-absorbable; nontoxic.**
- **No acid rebound phenomenon.**
- **No danger of alkalosis.**
- **Slightly astringent; demulcent; may increase mucin secretion.**
- **Prompt pain relief in uncomplicated cases.**
- **Rapid healing when used with regular ulcer regimen.**

BY MOUTH

BY DRIP



ALBA PHARMACEUTICAL COMPANY, INC., NEW YORK, N.Y.

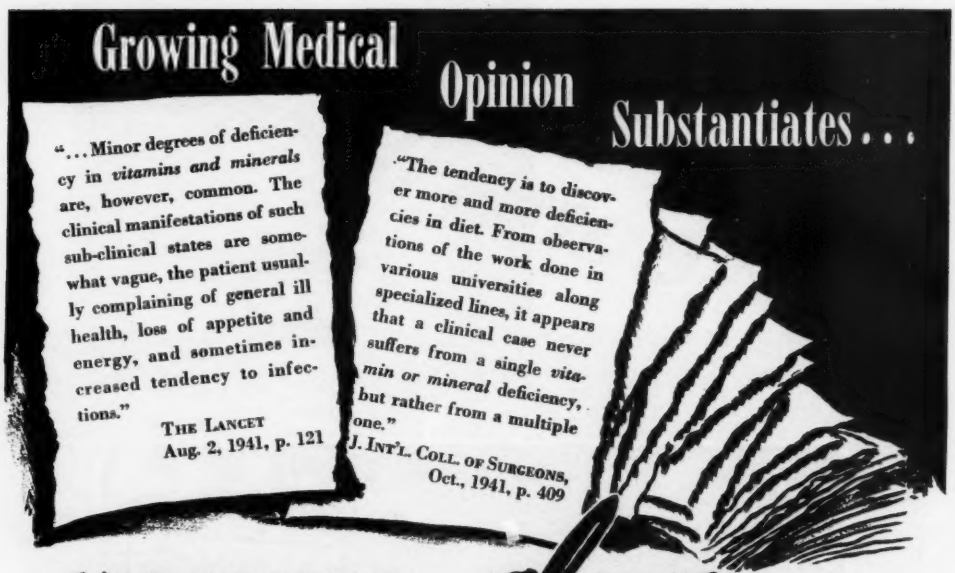
Growing Medical Opinion Substantiates . . .

"... Minor degrees of deficiency in *vitamins and minerals* are, however, common. The clinical manifestations of such sub-clinical states are somewhat vague, the patient usually complaining of general ill health, loss of appetite and energy, and sometimes increased tendency to infections."

THE LANCET
Aug. 2, 1941, p. 121

"The tendency is to discover more and more deficiencies in diet. From observations of the work done in various universities along specialized lines, it appears that a clinical case never suffers from a single *vitamin or mineral* deficiency, but rather from a multiple one."

J. INT'L. COLL. OF SURGEONS,
Oct., 1941, p. 409



VITAMINS *alone* ARE NOT ENOUGH

An increasingly impressive medical literature asserts the frequency of multiple deficiencies in both *vitamins and minerals* . . . and that for maximum effectiveness, vitamins are needed together with minerals.

As prophylaxis against multiple deficiencies, and as an aid in speeding recovery by support of the system's nutritional defenses . . . many physicians today make certain their patients receive, in addition to the usual diet, a supplement which . . .

SUPPLIES *BOTH* VITAMINS AND MINERALS

MINERAL CAPSULE

VI-SYNERAL

VITAMIN CAPSULE

[FUNK-DUBIN]

Contains VITAMINS: A-B_1-B_2(G)-C-D-E and other B Complex factors, fortified with MINERALS: calcium phosphorus, iron, iodine, manganese, magnesium, copper and zinc . . . separately balanced for each age group:

(1) ADULTS (2) INFANTS AND CHILDREN (3) ADOLESCENTS (4) EXPECTANT AND NURSING MOTHERS (5) SPECIAL GROUP (MIDDLE-AGED AND AGED PATIENTS.)

Literature and Sample Upon Request

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GERIATRICS...THE NEW NUTRITION PROBLEM

"The aged patient is prone to overindulge in foods his failing digestive system should not be asked to prepare for assimilation*. . " and yet "we can, if we will, keep our old better nourished and so more resistant to infections."**

HORLICK'S FORTIFIED

fits perfectly into the dietary of senescence because it provides

- Basic nutrition in liquid form
- Imposes little or no strain on digestion
- Insures a recognized, daily minimum requirement of Vitamins A, B_1, D, G

The flavor of Horlick's offers a special appeal to elderly patients because its frequent use does not tend to cloy or surfeit the palate.

Recommend

HORLICK'S

The *Complete* Malted Milk—Not Just a Malt Flavoring for Milk.

*Henry, C. E.: Mo. St. Med., 37:471, Nov. 1940.
**Northington, J. M.: So. Med. & Surg., p. 561, Oct. 1940.

HORLICK'S

How to control Diarrhea with Wyeth's **KAOMAGMA**

REG. U. S. PAT. OFF.

AT THE ONSET... administer two tablespoonfuls of Kaomagma Plain, in a little water

AND . . . follow this with one tablespoonful of Kaomagma Plain, after every bowel movement . . .

THEN . . . when stools become consolidated, one tablespoonful of Kaomagma with Mineral Oil 3 times daily may be indicated.

KAOMAGMA is the ideal palliative treatment for diarrhea. It consolidates fluid stools; coats, soothes and protects the inflamed intestinal mucosa and adsorbs and eliminates products of putrefaction.

Kaomagma Plain and Kaomagma with Mineral Oil are supplied in 12-oz. bottles.

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Council Accepted

In Congestive Heart Failure

For the reduction of edema and to diminish dyspnoea, give 1 to 3 tablets of Theocalcin, three times a day. Theocalcin, theobromine-calcium salicylate is a well-tolerated diuretic and myocardial stimulant for oral administration.

Available as 7½ grain tablets and in powder form.

Bilhuber-Knoll Corp. Orange, N. J.

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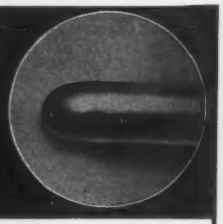

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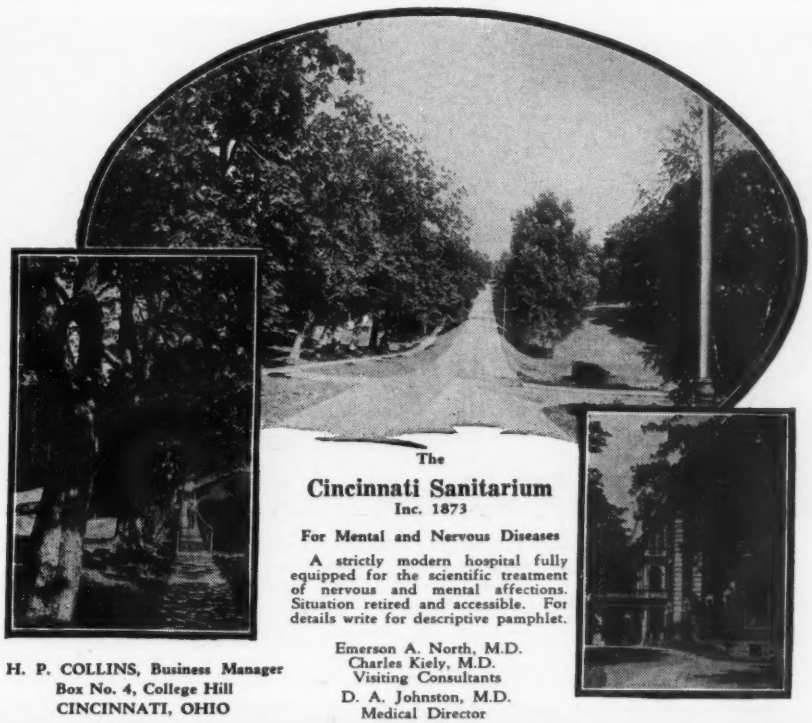

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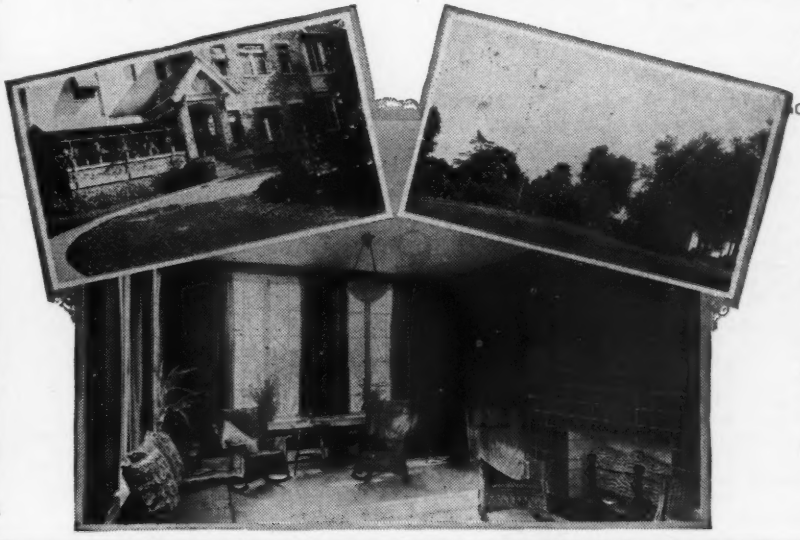

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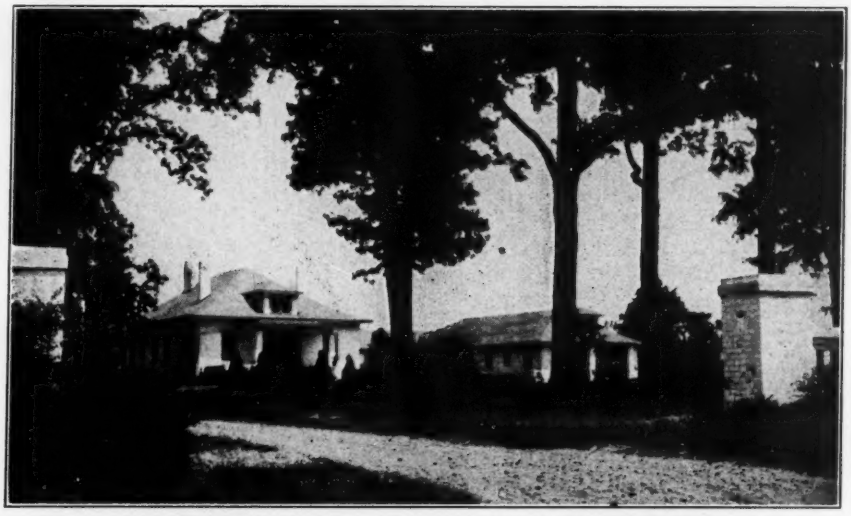

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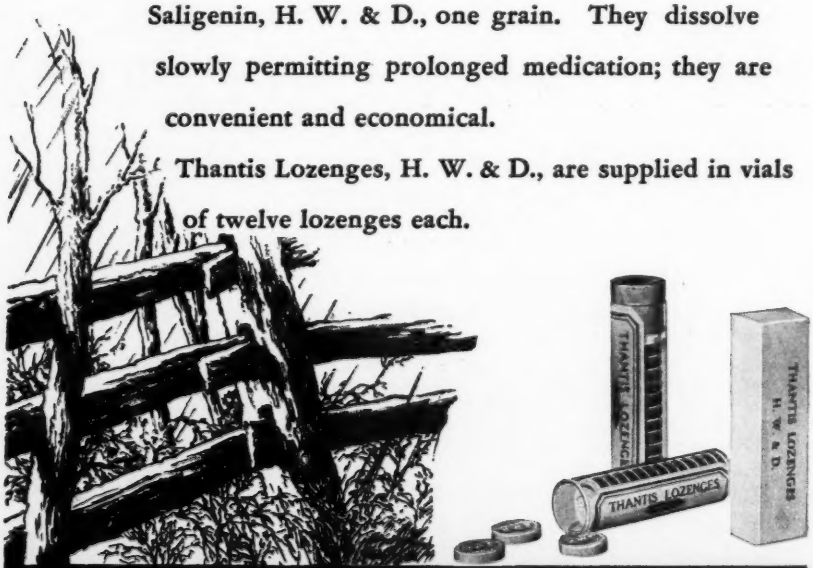

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VENTRICULAR STRAIN*

CHANGES IN THE ELECTROCARDIOGRAM PRODUCED BY ACUTE AND CHRONIC COMPRESSION OF THE PULMONARY ARTERY

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Interest in the study of changes in the hemodynamics of the circulation produced by obstruction in the pulmonary circuit has existed since Cohnheim's classical experiments. Numerous investigators have studied this problem and in recent years the trend of the investigation has been along three main lines: (1) The study of carotid and venous pressure and cardiac output in the presence of mechanical obstruction of the pulmonary artery. The electrocardiographic changes also have been investigated. (2) The study of electrocardiographic changes produced by experimental pulmonary embolism, together with studies upon pressure relationships in the arterial and venous circuits. (3) The electrocardiographic changes produced in clinical pulmonary infarction. The results obtained in these studies by numerous experimentors will be summarized later in this paper.

Partly as the result of experimental work and also of clinical observation, there has been a tendency to speak of ventricular strain both on the right and on the left side of the heart, and interest has been aroused in the functional and electrocardiographic changes in pulmonary infarction. McGinn and White[1] have applied the term cor pulmonale to cardiac disturbances resulting from conditions in the lung presumably resulting in increased pressure in the pulmonary circuit. Barnes and Whitten[2] have published tracings which are believed to indicate the presence of right or left ventricular strain.

While certain factors have been established in regard to hemodynamic changes produced by obstruction in the pulmonary circuit, there has been only partial coordination in the findings between experimental embolism, clinical pulmonary embolism, and direct obstruction to the pulmonary artery. So far as the electrocardiographic changes are concerned, the term "ventricular strain" has been used rather loosely to cover a condition in which in addition to increased back pressure in the aorta or pulmonary artery, many other factors such as diminished coronary flow, anoxemia, pulmonary reflexes, and even organic changes in the myocardium and vessels are present. If the term is to have significance, it would seem appropriate to limit it to a condition in which an otherwise presumably normal heart has encountered sufficient resistance to blood flow from the ventricle to overcome compensatory factors, but in which there has not as yet occurred actual damage structurally. To limit the term in this way might be sufficient to rob it of any clinical significance; on the other hand, to use the term loosely fails to take into account all of the various factors involved.

This study was undertaken for the purpose of determining whether obstruction of the pulmonary artery either acute or chronic would produce changes in the electrocardiogram similar to those noted in clinical pulmonary embolism or cor pulmonale. As will be noted later, other investigators have produced obstruction to the pulmonary circulation and noted the electrocardiographic changes; however, a correlation between the actual amount of obstruction and the

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changes in the electrocardiogram have not been clearly demonstrated. In this study, it was believed that the best point of departure would be from the first change produced in the electrocardiogram as obstruction occurred and to note the immediate and later effects from the amount of obstruction producing this first change.

METHODS AND MATERIALS

After preliminary experiments, the following procedure was adopted: average sized, healthy dogs were given sodium ethyl thiobarbiturate anesthesia intravenously. When the chest was opened, expansion of the lungs was maintained by oxygen insufflation by means of a tube in the trachea. For the acute procedure, a soft silver wire was passed around the pulmonary artery and through a cannula long enough to protrude through the chest wall after closure of the wound. It was possible to estimate the circumference of the artery and also to note the various changes by measuring the extent to which the wire was pulled through the cannula. After sacrifice of the animal, measurement of the pulmonary artery and the introduction of sounds through the constricted area indicate that the error by this means of measurement is not great enough to influence the results.

After the chest was closed, an electrocardiogram was taken and constriction of the vessel begun; by means of the lag screen, the complexes were watched and tracings taken as soon as any alteration appeared. Care was taken not to alter the animal's position during the course of the experiment. In a number of animals the venous pressure was recorded during the experiment, and there appears to be some coordination between the level of venous pressure and electrocardiographic change. In some instances, constriction on the vessel was increased beyond the appearance of definite change; in others, the pressure was released and electrocardiograms were taken at intervals. A few animals were allowed to survive and electrocardiograms were taken over a period of several months. Only the three standard limb leads were taken; it was not found practical to attempt chest leads because of the location of the incision.

For the establishing of chronic obstruction, essentially the same procedure was used except that the chest remained open until after the first change was noted. The constriction was halted at this point and the wire fastened in place. The chest was then closed and electrocardiograms taken at regular intervals thereafter.

Early in the experiments, it was found that if compression of the artery was carried beyond a certain point any regularity in the appearance of the electrocardiogram disappeared. A variety of changes occurred, including S-T_1 depression, bundle branch block, a-v block, auricular and ventricular premature contractions, nodal rhythm, idioventricular rhythm, and cardiac standstill. These changes have all been noted by other observers; on the other hand, if the experiment were halted at a certain point, no further changes appeared in the brief time of observation. Tracings were obtained, the nature of which could be predicted with reasonable certainty, and the animal returned to normal after release of compression, so far as the electrocardiogram was concerned.

It is well known that caution must be used in interpreting dog electrocardiograms. There are normal variations in the direction of the T-wave, and, as Hafkesbring and MacCalmont[3] have pointed out, the barbiturates may produce reversal of T-waves in both dogs and cats; Daly,[4] however, has seemed to establish that accentuation of negativity is equivalent to a reversal. It was also necessary to use care in the oxygen insufflation because any over-distention of the lungs produces in itself a rise in venous pressure. Considerable care must be used also in producing the compression. If the compression is produced suddenly, it may go beyond the point of the first change before that point can be noted; it was found best to take the wire up 0.5 cm. at a time and to wait a minute or two before going on. If this procedure was followed carefully, invariably the first thing to be noted was a depression of the S-T_2 segment. In all, more than forty observations were carried out on 25 animals; of these, 10 were studied intensively as regards the changes produced by original compression; and 7 animals were studied regarding the effect of chronic compression. Of these last, 4 died in a period of time from 2 days to 2 weeks, and 3 survived indefinitely.

IMMEDIATE RESULTS OF COMPRESSION

Fig. 1 shows the degree of reduction in gross cross section area of the pulmonary artery together with the percentage of the original. The figures underlined indicate the point at which electrocardiographic changes occurred. It is recognized that these figures are not necessarily

Dogs 1		2		3		4		5		6		7		8		9		10	
Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%	Mm.	%
81.0		205		153		433		239		160		153		197		97.2		197	
34.8	43.0	85.9	41.9	81.0	52.9	324	74.8	153	64.0	71.0	44.3	66.4	43.3	126	64.0	49.3	50.8	126	64.0
13.8	16.5	57.5	25.1	38.2	25.0	232	53.6	97.2	40.7	31.6	19.4			71.0	36.0	17.8	18.3	71.0	36.0
2.84	3.5(5)							57.5	24.1										

Fig. 1

Point at which compression of pulmonary artery produced electrocardiographic changes. First column shows original gross cross area and subsequent reduction. Second column shows percentage of original cross area.

accurate. Mann, Herrick, Essex and Balds[5] have pointed out the difference between internal lumen and the external circumference as compression is produced. Nevertheless, the figures agree fairly closely with those obtained by Gibbon, Hopkinson and Churchill,[6] who found that venous pressure, carotid pressure and cardiac output showed abrupt change when the pulmonary artery was occluded to between 15 and 40 per cent of its original size. The greatest change necessary to produce an effect in our series was 83.5 per cent; the smallest was 46.4 per cent. It is interesting to note that the dog with the largest circumference of the pulmonary artery required the smallest amount of compression to produce electrocardiographic change, while the dog with the smallest circumference required the greatest amount. Also, it may be seen that, whereas, by coincidence, Dog 8 and Dog 10 had exactly the same measurements and showed the change at exactly the same point, the electrocardiographic changes were not identical. On the average, electrocardiographic changes occurred when the circumference of the artery had been reduced by 20 mm.

Fig. 2 lists these changes produced in detail, and *Fig. 3* shows a composite type of electrocardiogram in the three leads, together with the number of times the changes listed occurred. It will be noted that the S-T change occurred in Lead II in all instances. In some, it consisted of a sharp downward swing of the S-T segment, ending in an inverted T. In others, the segment was relatively horizontal, but with a very markedly depressed take-off. Depression of S-T$_3$ occurred with slightly less uniformity as

	LEAD I					LEAD II					LEAD III					
DOG	P	Q	R	S	S-T	T	P	Q	R	S	S-T	T	P	Q	R	S	S-T	T
7	Unchanged	Decreased	Unchanged	ABSENT	Slightly depressed	Inverted	Slightly decreased	ABSENT	Unchanged	ABSENT	Marked depression	Inverted	Slightly decreased	ABSENT	Unchanged	Unchanged	Marked depression	Inverted
10	Unchanged	Disappears	Unchanged	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Unchanged	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Diminished	Reduced after Compression	Depressed	Unchanged
11	Unchanged	Unchanged	Diminished	ABSENT	Unchanged	Unchanged	Unchanged	ABSENT	Diminished	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Diminished	Slight increase	Depressed	Inverted
12	Unchanged	Unchanged	Unchanged	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Slightly reduced	Unchanged	Depressed	Unchanged	Unchanged	ABSENT	Reduced	Increased	Unchanged	Unchanged
13	Unchanged	Abolished	Unchanged	ABSENT	Unchanged	Unchanged	Unchanged	ABSENT	Diminished	ABSENT	Depressed	Inverted	Slightly reduced	ABSENT	Diminished	ABSENT	Depressed	Inverted
14	Unchanged	Abolished	Diminished	ABSENT	Unchanged	Unchanged	Unchanged	ABSENT	Unchanged	ABSENT	Depressed	Inverted	Diminished	ABSENT	Unchanged	ABSENT	Depressed	Diminished
16	Unchanged	Unchanged	Diminished	ABSENT	Unchanged	Unchanged	Unchanged	ABSENT	Unchanged	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Unchanged	Unchanged	Depressed	Inverted
18	Unchanged	ABSENT	Unchanged	ABSENT	Unchanged	Inverted	Increased	ABSENT	Diminished	Unchanged	Depressed	Inverted	Diminished	ABSENT	Diminished	Unchanged	Depressed	Inverted
19	Unchanged	ABSENT	Unchanged	ABSENT	Depressed	Inverted	Unchanged	ABSENT	Unchanged	Increased	Depressed	Inverted	Unchanged	ABSENT	Diminished	Increased	Depressed	Inverted
20	Unchanged	ABSENT	Diminished	ABSENT	Unchanged	Unchanged	Unchanged	ABSENT	Diminished	Increased	Depressed	Unchanged	Diminished	ABSENT	Diminished	Increased	Depressed	Unchanged

Fig. 2

Summary of changes produced by compression of the pulmonary artery. Where a wave is marked absent, it means that the wave was absent in the normal electrocardiogram.

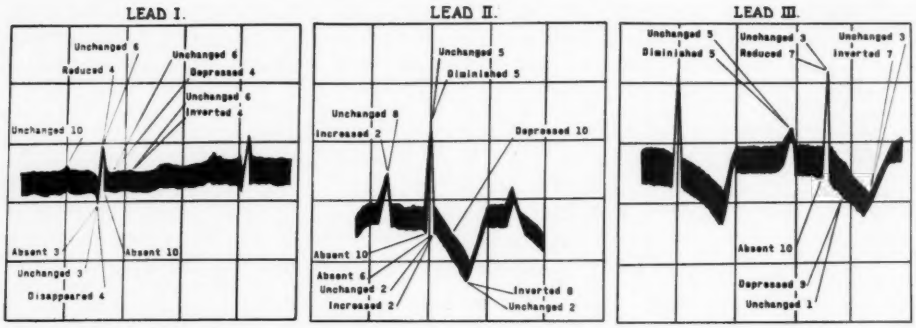

Fig. 3

Composite electrocardiograms of the changes produced in the three standard leads. The S-T segments did not always show a sharp down swing; often they were horizontal with a low point of origin.

did inversion of T_2 and T_3. These changes seem to be the only ones which may be called predictable. In four cases, some depression of S-T_1 occurred; this was never in the same degree as the depression in Lead II and Lead III, and probably represented the effect of a little more compression than was necessary to produce the first changes. T_1 was inverted in each instance in which S-T_1 depression occurred. It also was slightly inverted in one instance in which no depression occurred, but this was so slight as to be of little significance. It should be noted that no P-R or Q R S time changes occurred at this point. If compression was carried further, there were marked but variable alterations in both of these segments. The remainder of the changes occurred in too few instances to be of significance in this small series.

Fig. 4 shows a typical example of the findings noted above. This change disappears promptly when the pressure is released, and may be produced a number of times in the same animal.

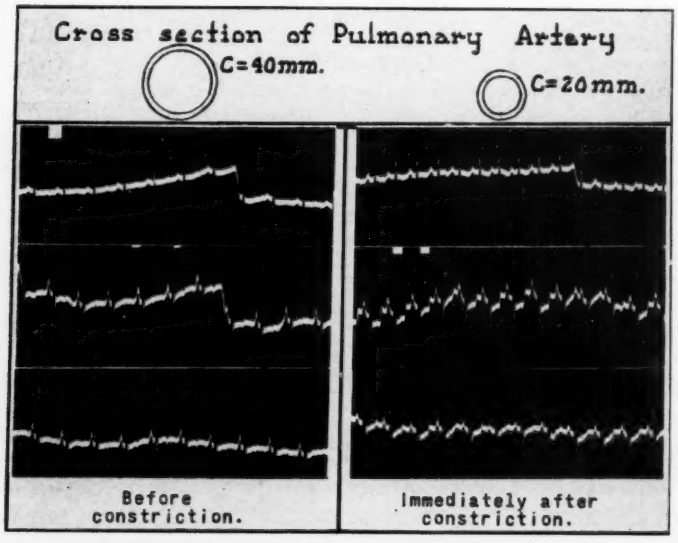

Fig. 4

Typical electrocardiogram produced by reduction of circumference, as noted above. The changes produced here disappear promptly with release of this degree of constriction.

LATE RESULTS OF CONTINUED COMPRESSION

It has been noted above that if compression is made to the point of producing the first electrocardiographic changes and then released, the electrocardiogram returns promptly to normal. If the constriction is halted when the first change occurs, and is maintained at that point, there are also certain definite findings as time goes on. Usually, the first change produced by compression disappears within the next 48 hours. Occasionally, as in *Fig. 5*, the change disappears within a few minutes, although the constriction has remained in place.

While the results in the beginning of compression are predictable, those obtained as the result of chronic compression show a considerable variation. It is almost impossible to summarize them, but a few changes occur which may be seen in all animals, but not necessarily at the same period of time. After chronic constriction is established, as has been said, the first depression of S-T_2 and S-T_3 disappears. Usually, a few days later, T_2 and T_3 become very much increased in amplitude: along with this may be inversion of T_1 or elevation of S-T_1.

Later, the usual picture is a return to iso-electricity of the S-T segments, but with inversion of T_2 and T_3. These changes are much less regular, however, than they appear from the description, and the same animal may show variations from day to day which perhaps are due to the degree of activity. No constant pattern has been obtained so far. *Fig. 5* shows these changes occurring over a period of six weeks.

DISCUSSION

Gibbon, Hopkinson and Churchill[6] found that gradual occlusion of the pulmonary artery up to 60 per cent of its area had no effect upon arterial or venous pressure, but between 60 and 80 per cent reduction in the area produced a fall in blood pressure and a rise in venous pressure together with reduced cardiac output. The point at which this occurred was abrupt and definite. Adams and Escudero[7] also showed that obstruction of the pulmonary artery produced a fall in carotid pressure. Studying this problem from the standpoint of experimental pulmonary embolism, results are not nearly so clear-cut. It has not been possible to measure the exact amount of interference with circulation, although studies by de Takats, Beck and Fenn,[8] Mendlowitz,[9] Buchbinder and Katz[10] suggest that in addition to other complicated factors to be noted later, essentially the same mechanism is present.

The electrocardiographic changes produced by obstruction of the pulmonary artery were studied by Krumbhaar,[11] who produced acutely increased pressure by means of ligation of the pulmonary artery. Experimental pulmonary embolism with the effect upon the electrocardiogram has been studied by Villaret, Justin-Besancon and Bardin,[12] Mendlowitz,[9] de Takats, Beck and Fenn,[8] Buchbinder and Katz,[10] Love, Brugler and Winslow.[13] Again, there has been considerable discrepancy in the results obtained, although all of these workers produced variable alterations in the electrocardiogram.

From the clinical side, observations have been made on the electrocardiogram in pulmonary embolism by McGinn and White,[1] Barnes,[14] Love and Brugler,[15] Sokolow, Katz and Moscovitz[16] and Stewart, Kirk and Smith,[17] as well as Scherf and Schonbrunner.[18] Without enumerating all of the findings, it may be said that there seems to be no invariable means of recognizing pulmonary embolism from the electrocardiogram.

To compare the findings of this study with the findings of some of the investigators noted above, Krumbhaar[11] found most frequently a deep, broad S_1, deep Q_2, medium R_2, and no S_2 and a high broad S_3. T-wave changes were variable. These findings should be interpreted as occurring when obstruction has progressed be-

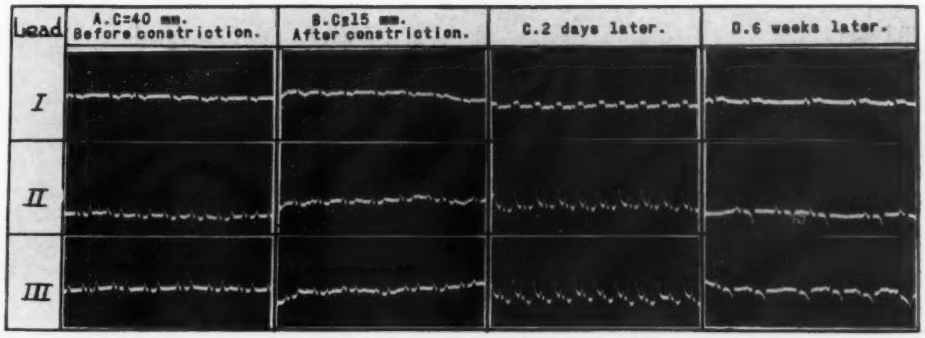

Fig. 5

Showing the effect of chronic constriction of the pulmonary artery after reducing the circumference from 40 mm. to 15 mm. In this particular animal, the characteristic early depression of S-T_2 and S-T_3 practically disappeared by the time the electrocardiogram was taken. The changes seen in C and D are common, but by no means invariable.

yond any possibility of compensation on the part of the heart. Bay, Gordon and Adams[19] found S-T depression in ligation of the pulmonary artery; this was presumably in Lead II, although it is not specifically stated. Mendlowitz[9] found elevation of S-T_2 and S-T_3 with inversion of T. He also found appearance of S_2 and S_3 in several experiments. In only one was there depression of S-T_2 and S-T_3. Buchbinder and Katz[10] show an electrocardiogram which resembles the composite shown here. De Takats, Beck and Fenn[8] found either elevation or depression of the S-T segments with inversion of T in Lead II. Clinically, pulmonary embolism was found by McGinn and White[1] to produce depression of S-T_1 and S-T_2 and inverted T_3. Stewart, Kirk and Smith[17] also found depressed R-T_1 and R-T_2. Sokolow, Katz and Moskovitz[16] found most constantly S-T depressed in Leads I and II and inverted T_3. Others have reported bundle branch block and variations in S_1.

It is felt that the failure of many of the findings above to coincide with the results obtained in this study is due to the fact that in the case of experimental pulmonary embolism, many factors in addition to any direct strain upon the heart are involved. The same is true in clinical pulmonary embolism; on the other hand, in most instances of experimental occlusion of the pulmonary artery, the degree of compression was only roughly controlled and, as noted above, if the compression is carried beyond a certain point, all regularity in the picture produced disappears.

The findings obtained in this study seem partially to corroborate the clinical findings of Barnes and Whitten,[2] who found T-waves inverted in Leads II and III in 83 per cent of the cases in which the condition produced disproportionate load on the right ventricle. As to the cause for the changes observed, explanation is somewhat difficult. Part of the electrocardiographic changes might be due to bundle branch block, but this could not be true of all of them. Sokolow, Katz and Moscovitz,[16] in their studies of pulmonary embolism, believe that elevated pressure in the right heart acts as an obstruction to coronary venous drainage and thus slows coronary flow. On the other hand, Durant, Ginsburg and Roesler[20] do not think the changes in pulmonary embolism are due to anoxemia; however, Kountz and Gruber,[21] in a study of electrocardiographic changes due to general anoxemia, describe findings similar to some of those seen in this study. Dearing, Barnes, Essex and Herrick show displacement of S-T segments, partial and complete heart block, and high T-waves in the presence of anoxemia.[22]

Since an invariable accompaniment of obstruction of the pulmonary artery sufficient to produce the changes described above is a marked rise in venous pressure, usually to 120 mm. of water and a corresponding drop in arterial blood pressure to at least 80 mm. of mercury, it would seem that interference with coronary flow followed by anoxemia of the heart muscle is the most reasonable explanation.

SUMMARY

Studies of electrocardiographic changes in dogs produced by compression of the pulmonary artery, controlled by means of observing the changes on the lag screen, show that the first change is a depression of S-T_2 followed by depression of S-T_3. If compression is released at this point, the complexes return to normal. If compression is increased beyond a certain point, a variety of unpredictable changes occurs, including bundle branch block, a-v block, auricular and ventricular premature contractions, nodal rhythm, idioventricular rhythm, and cardiac standstill. If the compression is allowed to persist at the point described above, these first changes usually disappear and are followed by a variety of S-T and T changes which finally usually settle down to leave only inversion of T_2 and T_3, with occasionally inversion of T_1. It is believed that these changes are due primarily to anoxemia and that in so far as the term "ventricular strain" as applied to findings in the electrocardiogram is concerned, is really an expression of myocardial anoxemia.

CONCLUSION

Controlled, graduated pressure upon the pulmonary artery produces at a certain point characteristic electrocardiographic changes. These are: depression of S-T_2 and S-T_3, inversion of T_2 and T_3 with occasionally other less constant findings. The effect of continued compression of the pulmonary artery is less definite, but seems to consist finally of inversion of T_2 and T_3 with other less characteristic changes in T_1 and in the S-T intervals.

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DISCUSSION (*Abstract*)

Dr. E. G. Scott, Lynchburg, Va.—Dr. Winans' paper represents a great deal of work. In this work he has attempted to ascertain whether an acute strain of one ventricle or sudden increase in the work that one ventricle is called on to do will cause a characteristic and consistent change in the electrocardiogram. His method of producing this strain is logical and proper, that is, by narrowing the lumen of the aorta or of the pulmonary artery. He recognizes the complicating factor of coronary artery blood pressure and blood flow, that is, the oxygen supply to the myocardium. It would be interesting to know the ventricular or arterial pressure proximal to the constriction, so that we might know the approximate increase in the work of the ventricle in his experiments. Those of you who have given infusions know that in order to slow the rate of flow appreciably it is necessary to occlude almost completely the tubing with the screw clamp.

One might think that a coronary occlusion affecting mainly the blood supply of one or the other ventricle would offer an ideal clinical example of acute ventricular strain. However, as he points out, this is really an instance of acute ventricular weakness or failure. Cardiac asthma, or paroxysmal nocturnal dyspnea occurring, as it does most commonly, in clinical conditions that would naturally throw an increased load on the left ventricle, would seem to be another clinical example of left ventricular weakness and possibly right ventricular strain. In this condition, however, we cannot be sure that a decrease in coronary flow or pressure may not be a complicating factor. We know, for instance, that the heart rate, the blood pressure, and the rate of flow are all decreased during sleep. During an attack of cardiac asthma which is recognized by most authorities as being due to acute imbalance of the two ventricles or acute failure of the left ventricle, the electrocardiogram even in the absence of a coronary occlusion which may be a cause of such an attack, may show a temporary depression of the T-waves or other abnormality. The blood pressure during such an attack may be normal or increased.

While Dr. Winans does not draw any final conclusions from his work, it is interesting to note that he has demonstrated definite changes in the electrocardiogram due to an acute strain of one or the other ventricle.

I agree with him that the term "ventricular strain" as commonly employed is not a good one and should be replaced by a more definitive one.

Dr. Neuton S. Stern, Memphis, Tenn.—The experiments that have been reported are all acute ones, as has been definitely stated. They have lasted only a few moments, or at most fifteen or twenty minutes. Therefore, we cannot be sure under these circumstances that the ventricles put under extra load have gone beyond their physiologic limits. We have to draw a line somewhere. Where does strain begin and where does extra work end? One might say that the heart is not under a strain until the ventricle has gone beyond the usual physiologic limits. We know that in our own healthy living we can do a certain amount of work, even hard work, and do it with ease; we can put added burdens on the circulation. That is not necessarily strain. When we do more than physiologically we are able to do, then our organism is definitely under strain.

The obstacles that have been put in the way of the circulation here are certainly more than the heart eventually could overcome, but for the short period of time that the experiment lasted we cannot be sure that the ventricles have exhausted their resources, and what strains have come about may have come about as a result of disturbances in circulation, outside of the heart as well as in it.

It is interesting that the pictures that prompted this work of ventricular strain have been associated with enlargement of the ventricles. That usually is the result of long-continued overwork or strain. It is interesting that recent work has also shown that these changes may go on, even to the electrocardiographic picture of bundle branch block, without any definite bundle branch

block. This work showed that bundle branch block is not necessarily due to anything more than marked enlargement of the ventricles. It would be extremely interesting if Dr. Winans would continue his work and attempt to develop these things by chronic experiments rather than acute ones.

CERTAIN CONSTITUTIONAL MANIFESTATIONS OF THYROTOXICOSIS*

By HUGH J. MORGAN, M.D.
Nashville, Tennessee

The problem of Graves' disease is obscure. Its etiology is unknown, its pathogenesis is only partially understood, and its therapy is largely empirical. It has been defined recently by Means as

"a constitutional disturbance involving a complicated hormonic imbalance, having widespread effects in which the thyroid is but one item."[1]

That hyperactivity of the thyroid gland is responsible for the majority of symptoms is evident but, as pointed out by Barr,[2] the ultimate cause or the reason why the gland becomes over-active is not apparent. That the thyrotropic hormone of the pituitary may be concerned in the disorder seems probable in the light of experimental observations and because of the frequency of hyperthyroidism secondary to acromegaly. Adolescence, pregnancy, psychic trauma and infection are factors which have been emphasized. Whatever the cause of the "hormonic imbalance" may be, its chief manifestations can be reproduced by excessive thyroid administration and the disorder which results from it reflects itself in many structures and functions of the body. Not only is the basal metabolic rate increased in thyrotoxicosis, but the additional oxygen consumption occasioned by work, food and emotional activity is greater in the thyrotoxic than in the normal person.[3] Moreover, deviations occur from the normal carbohydrate metabolism (diminished glucose tolerance, glycogen depletion), fat metabolism (hypocholesterolemia), protein metabolism (creatinuria), calcium, phosphorus and iodine metabolism, water balance and vitamin storage. The minute volume output of blood by the heart is increased as is the velocity of blood flow. The nervous system exhibits increased irritability and speed of reaction and heightened vasomotor reactivity. These manifestations of thyrotoxicosis can be reproduced experimentally by excessive administration of the thyroid hormone, thyroxin. When they develop spontaneously they can be cured usually by partial removal of the thyroid gland. Exophthalmos, often a conspicuous feature of thyrotoxicosis, is apparently due to the action of the thyrotropic hormone of the pituitary gland.[4]

Clinicians, in their consideration of thyrotoxicosis, place the emphasis on the changes in the thyroid gland and on the nervous and circulatory phenomena. These determine the generally accepted clinical pattern of thyrotoxicosis. Thus, the striking features of the pattern are related to the readily observable manifestations of overactivity of the thyroid gland, that is, hyperthyroidism.

It is not the purpose of this communication to discuss the commonly encountered metabolic, circulatory and nervous features of Graves' disease, but to re-emphasize that, in this constitutional disorder intimately associated with hyperactivity of the thyroid gland, other phenomena of great interest may occur. In rare cases these may be so conspicuous as to alter the usual pattern of the disease and lead to mistakes in diagnosis and treatment. They are osteoporosis, myopathy, exophthalmopathy, and avitaminosis.

OSTEOPOROSIS

Albright,[5] in a recent contribution, says that over 99 per cent of the body calcium is in the form of a calcium phosphate-calcium carbonate compound which is deposited in the organic matrix of bone and teeth. The remainder of the calcium is present in the body fluids (calcium ions and calcium proteinate). Calcium deposition in and resorption from bone is a continuous process. If more of ingested calcium is retained in the body and deposited in bone than is excreted in feces and urine the calcium balance is positive; if less, the balance is negative. In hyperthyroidism the balance may be and often is negative, that is, the body actually excretes in feces and urine more calcium than is ingested. Under these circumstances, the calcium stores (bones) are depleted and demineralization ensues.

Albright and associates[5 6] state that osteoporosis develops in conditions in which the formation of bone is decreased; that this decreased formation is due to a failure of the osteoblasts

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*From the Department of Medicine, Vanderbilt University School of Medicine, Nashville, Tennessee.

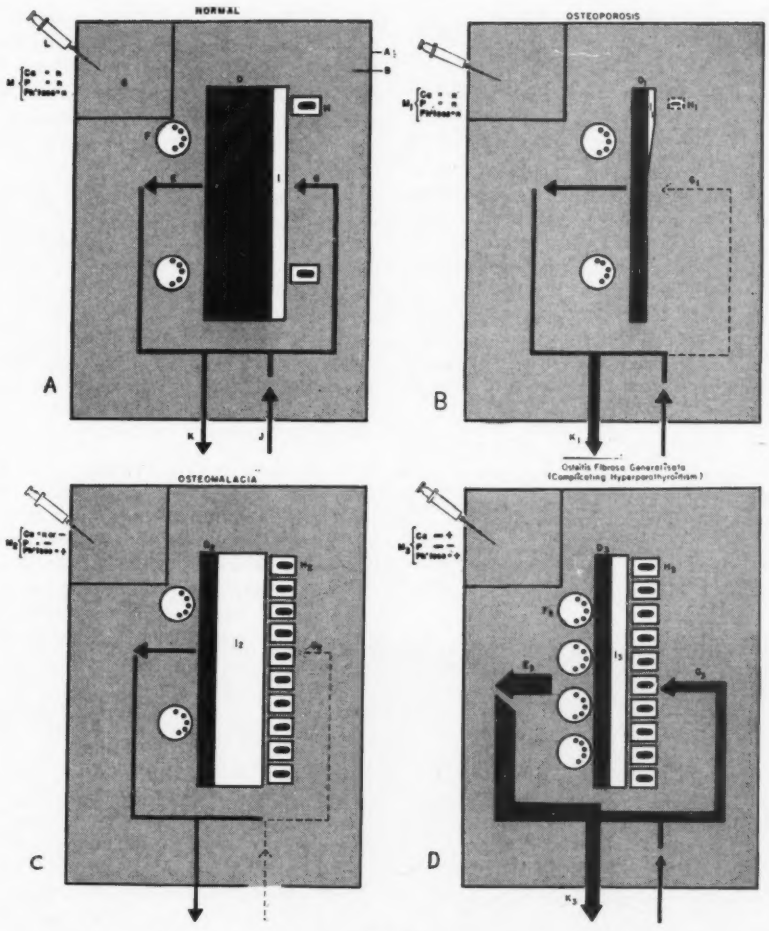

Fig. 1*

Schematic diagrams to show the authors' conception of differences among normal function of bone, osteoporosis, hyperparathyroidism with osteitis fibrosa generalisata and osteomalacia. *A*, body limits; *B*, body fluids; *C*, body serum, a compartment of fluid easy to tap for analysis; *D*, mass of bone with two surfaces, one at which bone is being resorbed and at which it is being laid down; *E*, arrow indicating by its size the rate of resorption of calcium and phosphorus; *F*, osteoclast; *G*, rate of deposition of calcium and phosphorus; *H*, osteoblast laying down osteoid (*I*); *J*, calcium and phosphorus entering the body from the gastro-intestinal tract; *K*, calcium and phosphorus leaving the body by the kidneys or by other exits; *L*, syringe obtaining serum for analysis, and *M*, blood values (n = normal. + = high and — = low).

A. *Normal.*—Note that the calcium and phosphorus going into bone equals that coming out of bone and that part of that which comes out goes back in.

B. *Osteoporosis.*—Note decreases in the mass of bone (D_1); primary hypoplasia of osteoblasts (H_1); decreased deposition of osteoid (I_1); decreased deposition of calcium and phosphorus (G_1); increased excretion of calcium and phosphorus (K_1), and normal blood values (M_1).

C. *Osteomalacia.*—Note decreased mass of bone (D_2); hyperplasia of osteoblasts because of increased stresses and strains (H_2); increased deposition of osteoid which is inadequately calcified because of serum calcium and phosphorus values; decreased deposition of calcium and phosphorus (G_2); primary difficulty in absorbing calcium and phosphorus from the gastro-intestinal tract (J_2), and abnormal blood values (calcium normal or low, phosphorus low and phosphatase high).

D. *Osteitis Fibrosa Generalisata Complicating Hyperparathyroidism.*—Note increased excretion of calcium and phosphorus in the urine (K_3); increased resorption of calcium and phosphorus (E_3); increase of osteoclasts (F_3); decreased mass of bone (D_3); increased formation of bone by osteoblasts (I_3) because of increased stresses and strains; increased deposition of calcium and phosphorus (G_3) because serum is not undersaturated in respect to calcium phosphate (i. e. the serum calcium level is sufficiently high almost to offset the low serum phosphorus content), and the high phosphatase level (M_3).

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*Figures and legend from "Postmenopausal Osteoporosis, Its Clinical Features." by Albright, Fuller; Smith, Patricia H.; and Richardson, Anna M.: J.A.M.A., **116**:2465 (May 31) 1941. Reproduced by permission of the authors and J.A.M.A.

("hypoplasia of osteoblasts") to lay down sufficient osseous matrix ("atrophy of bone matrix") rather than a failure of calcium salts to be deposited in the organic matrix; that, in the light of this concept, osteoporosis is a product of disturbed tissue metabolism rather than a product of disturbed calcium metabolism* (*Fig. 1*).

Several factors directly related to hyperthyroidism may participate in the disturbed mineral metabolism which produces a negative calcium balance and osteoporosis: (a) acidosis due to a negative nitrogen balance, (b) the inability of osteoblasts to lay down the necessary organic matrix in the presence of a negative nitrogen balance or other factors associated with thyrotoxicosis, (c) the direct catabolic effect on bone of hypermetabolism, (d) diets deficient in either calcium or vitamin D or both, and (e) concurrent parathyroid over-activity. Other factors not related directly to hyperthyroidism, but of established importance in the development of osteoporosis are senescence, disuse and the menopausal state.

Significant osteoporosis has been observed in several cases of thyrotoxicosis at the Vanderbilt University Hospital. A study of this material was presented by Dr. Robert H. Williams and the author[7] in 1940. A case history from this report describes a colored woman, 39 years old, who was first admitted to the hospital January 27, 1931. At that time she had definite signs of hyperthyroidism with a basal metabolic rate of +65 per cent.

Despite thyroid surgery she continued to exhibit signs of hyperthyroidism, and in December, 1938, roentgenograms revealed marked demineralization of the entire dorsal and lumbar spine and a compression fracture of the body of the third lumbar vertebra (*Fig. 2 A*). Other fractures occurred. Roentgenograms of the skull and long bones indicated marked generalized demineralization.

After partial thyroidectomy, in 1939, a slight increase in the density of the bones was apparent (*Fig. 2 B*).

At necropsy the bones were soft and "could be cut with a knife as after the use of nitric acid." Microscopic sections revealed diminution in the number of bone spicules and thinning of the bone cortex (*Fig. 3*). The ovaries were described as senile.

This case is of special interest because the patient suffered from thyrotoxicosis for a period of eight years, at the end of which time marked osteoporosis was observed. Two compression fractures of lumbar vertebrae and a fracture of the left femur occurred as a result of falls. The x-ray findings leave little doubt that the fractures were due in part at least to osteoporosis. The history certainly leaves little doubt that the osteoporosis was associated with and probably due to thyrotoxicosis. The age of the pa-

*In the *Journal of the American Medical Association*, vol. 116, p. 2465 (May 31) 1941, Fuller Albright, Patricia H. Smith and Owen M. Richardson published an important contribution to the subject of osteoporosis. The schematic diagrams of their conception of differences among normal function of bone, osteoporosis, hyperparathyroidism and osteomalacia are reproduced here with their permission in *Fig. 1*. Although we are not concerned, in the present discussion, with osteomalacia or hyperparathyroidism, it is felt that the diagrams pertaining to these conditions are most instructive and they are included for purposes of orientation.—H. J. M.

Fig. 2

Osteoporosis. Patient P. B. A. Compression fracture of L3. B. Four months after thyroidectomy.

tient is against the menopause as a factor in the pathogenesis of the osteoporosis unless, indeed, there was present ovarian failure secondary to thyrotoxicosis. However this may be, it seems highly probable that thyrotoxicosis was primarily responsible for the marked osteoporosis observed.

THYROTOXIC MYOPATHY

Some atrophy of muscles and associated myasthenia is common in thyrotoxicosis, but until recently there were relatively few reports in the literature of significant clinical manifestations of the phenomena. Nevertheless, in rare cases the myopathy and weakness may be so conspicuous as to dominate the clinical picture and lead to erroneous diagnosis. We have observed a patient who was admitted to the wards of the hospital with the provisional diagnosis of progressive central muscular atrophy. Creatinuria was present, indicating a profound disturbance of muscle metabolism. Instances of myasthenia gravis and exophthalmic goiter are recorded, and Palmer, Carson and Sloan[8] suggest that this may indicate a disturbance in the formation of phosphocreatinine. That thyroid hormone may affect the enzyme system which controls phosphocreatinine formation and destruction is suggested by Shorr, Richardson and Wolff.[9] A recent important communication by Blalock, Harvey, Ford and Lilienthal[10] emphasizes that thymic enlargement occurs in myasthenia gravis and that thymectomy may be followed by marked improvement of muscle function. Dr. A. M. Harvey, in a personal communication, points out that thymic enlargement also occurs in many cases of Graves' disease and suggests the possibility of a similar relationship in so far as the myasthenia is concerned. The fat stores of the body are reduced in thyrotoxicosis and glycogen depletion occurs also. Boothby and associates[11] found that protein storage occurs in amounts of nearly 2 kilograms in a man of average size, and it has been suggested[12] that

> "myopathy in thyrotoxicosis occurs chiefly in those subjects whose 'deposit protein' is exhausted and whose muscles are thus made vulnerable to the effects of excessive metabolism."

Dr. Robert H. Williams and I[12] presented

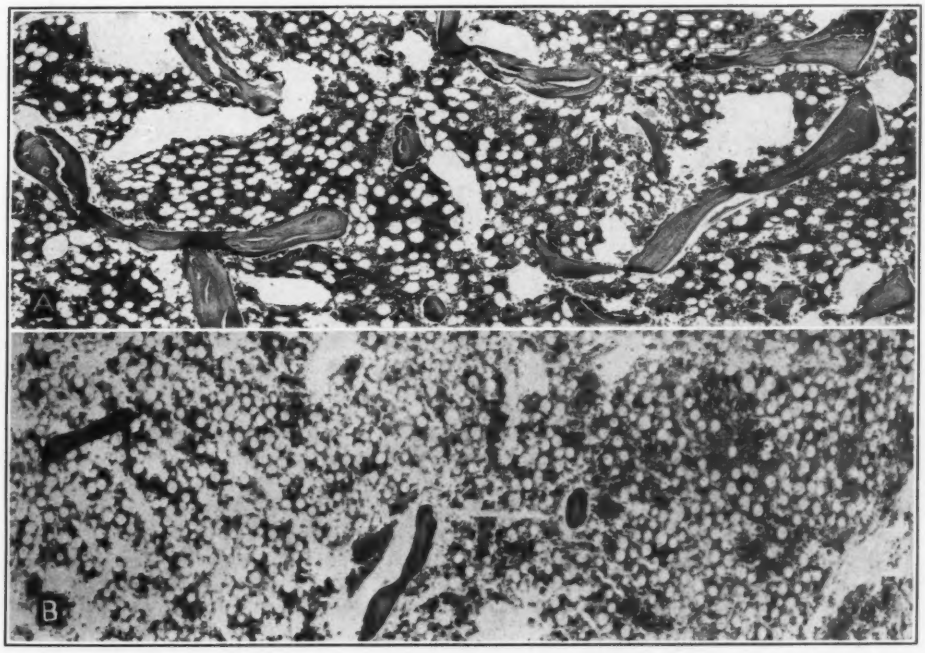

Fig. 3

Osteoporosis. Patient P. B. A. Normal bone (H & E X 34) from female subject, aged 60 years. For comparison with B. B. Osteoporosis (H & E X 34). Patient P. B. Note paucity of bone spicules.

before this Association in 1939 several instances of thyrotoxic myopathy and recorded the death of a patient from exhaustion of the muscles of respiration while undergoing "iodine preparation" for thyroidectomy. The outcome in the following case of thyrotoxic involvement of the muscles of respiration was quite different fortunately, although the problem was similar.

S. D., a negro laborer, aged 57 years, was admitted to the Vanderbilt University Hospital May 22, 1941, complaining of shortness of breath, weakness and nervousness.

About 4 months before admission to the hospital the patient developed progressive weakness and malaise in association with polydipsia and polyuria. The latter symptoms soon disappeared, but asthenia persisted. After about 6 weeks he experienced nervousness and shortness of breath. The latter increased to the point that he had to assume an upright position at times. He stopped work and consulted a physician, who told him that he had heart disease and nervousness and prescribed 20 drops of a white medicine after meals. Temporary improvement ensued and he attempted to work again, but without success. For the 5 weeks preceding admission to the hospital he remained in bed. He noted an unusual sense of warmth and he perspired freely during this period. His appetite remained good until shortly before admission. Shortness of breath, weakness and nervousness constituted his chief complaints.

At bed rest the temperature varied between 98 and 99.6°; the pulse 90 to 120; the respirations 26 to 44; the blood pressure 136-150/60-90. He was a large, rather emaciated negro man who sat upright in bed, breathing rapidly. The respirations were regular but shallow. He could cease breathing for relatively long periods and was able to breathe slowly and deeply when instructed to do so. When undisturbed the respirations reverted to the rapid rate. There was striking generalized atrophy of the skeletal muscles, and occasional fibrillary twitchings were noted over the deltoids and biceps. The atrophy was relatively greater in the small muscles of the hands than elsewhere (*Fig. 4 A*). The deep reflexes were hypoactive. The superficial reflexes were normal. General tremulousness was present. Both lobes and the isthmus of the thyroid were readily palpable. The heart was not remarkable except for tachycardia. There were no signs of congestive heart failure. The remainder of the physical examination was not remarkable. There were no eye signs of thyrotoxicosis. The basal metabolic rate was +47 per cent. A hypochromic anemia was present (r.b.c. 4.5 million, hemoglobin 10 grams). The white blood cell count was 6,100 and 45 per cent of the cells were lymphocytes. The serum albumin and globulin and serum calcium and phosphorus values were normal. The blood cholesterol was 147 mg. per 100 c. c.; nonprotein nitrogen 31; sugar 86. The cerebrospinal fluid was normal. The vital capacity was 2,100 c. c. An x-ray examination of the chest revealed no evidence of an infiltrative process in either lung, and the heart, mediastinum and diaphragm were considered normal. The lungs appeared somewhat emphysematous. On fluoroscopy the diaphragm moved normally.

Fig. 4
Thyrotoxic myopathy. Patient S. D. A. Atrophy of intrinsic muscles of hands. B. Hands two months after thyroidectomy.

Five days after the institution of iodine therapy decided changes were noted in the respiration, pulse and metabolic rate. The latter fell to +17 and the respirations for the first time were recorded as 20 on one occasion. A subtotal thyroidectomy was performed 12 days after the institution of iodine therapy and at a time when the basal metabolic rate was —6 per cent. The pathologist's diagnosis was "diffuse toxic goiter exhibiting effects of iodine therapy."

The recovery from operation was uneventful. The respirations varied between 20 and 30 at the time of his discharge from the hospital. The vital capacity 10 days after operation was 3,400 c. c. He felt greatly improved. For a period of approximately 2 months improvement continued and he gained 13 pounds in weight. He regained his strength and was free from either respiratory or circulatory complaints. The thenar and hypothenar eminences appeared normal (*Fig. 4 B*).

Recently symptoms attributed to arteriosclerosis have developed. The basal metabolic rate is —14 per cent and thyroid has been prescribed. There is evidence of a slight increase in the size of the heart and he complains of exertional dyspnea. The respirations at rest are entirely normal and muscle atrophy, which was conspicuous at the time of his hospital admission, has largely disappeared.

With the development of thyrotoxicosis in a 60-year-old negro with arteriosclerosis and emphysema, striking generalized asthenia and tachypnea were experienced. The tachypnea appeared to be directly related to asthenia and disappeared when strength improved. Both tachypnea and asthenia were associated with striking generalized muscular atrophy. In the absence of any other explanation we are convinced that the myopathy involved the intercostal muscles and accessory muscles of respiration and was responsible for the tachypnea. Following a satisfactory postoperative remission with recovery from thyrotoxicosis and tachypnea, symptoms due to generalized arteriosclerosis have become manifest together with evidence of diminished cardiac reserve.

POSTOPERATIVE OPHTHALMOPLEGIA

Another disturbance seen occasionally during or after Graves' disease has been called exophthalmic ophthalmoplegia, postoperative ophthalmoplegia and more recently "Graves' disease with dissociation of thyrotoxicosis and ophthalmopathy."[1] As indicated in two of these descriptive terms there are instances of Graves' disease in which exophthalmos and other ocular symptoms occur without the usual time relation to thyrotoxicosis. Indeed, they may make their appearance months after recovery induced by thyroidectomy. These ocular manifestations differ radically from the myopathies discussed in the preceding section in that skeletal muscle wasting and weakness when present are invariably associated with the thyrotoxic state and tend to disappear following relief from thyrotoxicosis. The ocular troubles may progress or may appear for the first time after recovery from thyrotoxicosis. These clinical observations support experimental evidence which indicates that the thyrotropic hormone of the anterior pituitary gland rather than thyroxin is involved in the pathogenesis of the ophthalmopathy of Graves' disease.

In the following case the eye signs were minimal at the time thyroidectomy was performed for frank though not severe hyperthyroidism. In a matter of a few months and at a time when the basal metabolic rate was —13 per cent unilateral exophthalmos and weakness of an ocular muscle on the exophthalmic side developed.

R. C., aged 61, an insurance executive, was admitted to the hospital November 2, 1936. For six months he had noted weakness. During the three weeks which preceded his admission he developed clear-cut symptoms of thyrotoxicosis. He exhibited the signs of mild hyperthyroidism. A moderate, diffuse enlargement of the thyroid gland was present. No muscular or neurologic abnormalities were observed. There was no exophthalmos. The basal metabolic rate was +23 per cent. A subtotal thyroidectomy was performed November 17. The pathologist considered the gland typical of exophthalmic goiter. The patient's postoperative course was satisfactory, and he was discharged December 15, at which time the basal metabolic rate was —2 per cent. His condition remained satisfactory until January, 1938, fourteen months after thyroidectomy, when diplopia developed. At about the same time his wife noted that slight edema of the right eyelid and right exophthalmos were present. The basal metabolic rate, determined two weeks after the onset of diplopia, was —13 per cent.

He was admitted to the hospital April 22, 1938, complaining only of diplopia when looking to the right and downward, and exophthalmos. On examination he was found to have slight exophthalmos on the right and edema of the right upper eyelid. Ophthalmologic examination revealed weakness of the right inferior rectus muscle. There was no manifest strabismus. No other neuromuscular disturbance was present, and there was no evidence of thyrotoxicosis. The basal metabolic rate was —19 per cent. The Wassermann test on the blood was negative. The spinal fluid was clear, under normal pressure and contained 2 cells per cu. mm. There was no excess globulin and the Wassermann reactions were negative with 0.2, 0.5 and 1 c. c.

The diplopia was improved by the use of glasses and the patient was discharged. The unilateral exophthalmos persists (1941). Treatment with thyroid may have prevented progression, but has been followed by no improvement.

The case constitutes a typical example of postoperative ocular trouble in a patient treated for mild Graves' disease, the ophthalmopathy developing 14 months after subtotal thyroidectomy. The ophthalmopathy of Graves' disease is generally believed to be due to edema of the orbital structures. In mild cases of thyrotoxicosis with severe ophthalmopathy Means[1] advises against thyroidectomy and advocates instead the administration of both iodine and thyroid, "holding the metabolic rate as low as possible with iodine" and giving thyroid to the limit of tolerance. Thy-

roid is employed for its diuretic action upon edema of the orbital tissues and because of its inhibiting effect upon the production of pituitary thyrotropic hormone, a hormone which favors water storage. When thyrotoxicosis is severe and associated with severe ophthalmopathy, and in his large experience, this is not frequent, Means advocates iodine and irradiation rather than thyroidectomy, since he believes the former treatment is less apt to aggravate the eye condition. This patient's present ophthalmologic difficulties are certainly more impressive and perhaps as disabling as were the manifestations of thyrotoxicosis in 1939. In retrospect one must admit that a trial of nonoperative treatment for thyrotoxicosis (iodine, irradiation) might have been successful and that had it been successful the patient might have been spared the development of ocular complications. Means feels it probable that

"the symptoms of hyperthyroidism are related to the colorigenic action of thyroid hormone" and that "the ophthalmic changes are related to changes in water balance which result from altered balance between hormones which produce water storage, such as the thyrotropic hormone of the pituitary and those which produce discharge of the water, such as the thyroid hormone. In considering the morbid physiology of Graves' disease *in toto* and in attempting to derive a rational mode of treatment therefrom, it is quite as necessary to take into account the changes in water balance which lead to eye signs as the hypermetabolism which leads to tachycardia, weight loss, sweating, and so forth."[1]

AVITAMINOSIS

Deficiency states occur when (1) the diet contains the necessary vitamins in amounts which are inadequate for the metabolic needs of the body, (2) when either digestion of food or absorption of the vitamins contained therein is faulty, (3) when vitamin storage is deficient. In hyperthyroidism the increased metabolic rate characteristically leads to a general nutritional deficit and this is reflected in body wasting. The need for calorigenic material is not met completely by the diet, the body tissues are utilized and depletion results. Thus it appears reasonable to anticipate that in long-standing thyrotoxicosis not only will a relative dietary deficiency obtain, as regards calorigenic material, minerals and vitamins, but that a depletion of the body's stores of these substances will ensue and that this will follow even if digestion and absorption are not significantly disturbed. Thus, it is to be expected on theoretical grounds that both a quantitative and qualitative disturbance of nutrition will obtain in thyrotoxicosis and that in this disorder a diet adequate for normal individuals may prove to be inadequate. The following case report is illustrative:

E. T., a 67-year-old white woman, was admitted to the hospital 6 months after an attack of influenza, from which she had never recovered. Cough, weakness, muscle and joint pains, nausea, vomiting and nervousness were the presenting symptoms. A diagnosis of inoperable carcinoma of the stomach had been made by her local physician and a roentgenologist. For a month prior to admission she vomited after each meal. She experienced a loss of 50 pounds in weight during the 6 months of her illness and had been confined to her bed throughout the entire period. Her family had been informed that she could live only a few weeks longer.

The temperature was 98 to 100°, pulse 100 to 130, respirations 20 to 28, blood pressure 170/70. She was an extremely malnourished, emotionally unstable woman who cried out with pain on the slightest movement of the bed. The skin was very dry and shiny about the wrists, ankles and neck and there was some exfoliation. The eyes were not remarkable. The lips were dry and cracked and the corners of the mouth were fissured. The tongue was red and atrophic. The heart was of normal size. There was a blowing systolic murmur at the apex, A_2 was slightly accentuated, and there were frequent extrasystoles. The abdomen was normal. There was moderate dorsal kyphosis of the spine. The extremities were quite tender and the hands and feet were a little swollen. The joints exhibited evidence of mild atrophic arthritis. The knee jerks and ankle jerks were not obtained. Hyperesthesia was marked. The thyroid contained a firm nodule about 3 cm. in diameter in the right lobe and the thyroid isthmus was prominent. The left lobe was not palpable. The urine was not remarkable save for persistent slight pyuria. The red blood cell count was 4.3 million, the hemoglobin estimation 12 grams. The leukocyte count was 4,100 with a normal differential formula. The serum protein values were: albumin, 3.16 grams per 100 c. c.; globulin, 2.45; total, 5.61. The serum calcium was 8.5 mg. per 100 c. c.; phosphorus, 2.1. The electrocardiogram revealed premature ventricular contractions and sinus tachycardia. The basal metabolic rate was +38 per cent. Following the use of iodine, thiamin, nicotinic acid, brewer's yeast, a general diet, and blood transfusions, nausea and vomiting ceased. She insisted that she could not take fruit juices. Ascorbic acid was not administered. She gained weight and strength and the basal metabolic rate fell to +14 in a period of 10 days. The appearance of the skin, lips and tongue improved remarkably and hyperesthesia disappeared. Subtotal thyroidectomy was performed. The pathologist interpreted the specimen as a typical example of toxic adenoma of the thyroid. Following subtotal thyroidectomy and at a time when she was getting out of bed for the first time in six months, she developed purpura over the lower extremities (*Fig. 5*). A tourniquet applied to the upper extremities resulted in the prompt appearance of a purpuric rash. The ascorbic acid content of the plasma at this time was 0.208 mg. per 100 c. c. and of the white blood cells 14.58 per 100 grams of leukocytes. Under intensive vitamin C therapy these values rose in three days to a plasma content of 0.924 and a white blood cell content of 39.49. At the time of her discharge from the hospital the patient's basal metabolic rate was —12 per cent. The tongue and lips were of normal appearance. The hyperesthesia of skin and muscles had en-

tirely disappeared. The knee jerks and ankle jerks could be obtained. The purpuric eruption was fading. The patient was re-examined two months after discharge from the hospital. She had gained approximately 20 pounds in weight and except for the persistence of inactive atrophic arthritis she appeared remarkably well.

The clinical evidence of vitamin deficiency was impressive in this case and suggested deficiencies of thiamin, nicotinic acid, riboflavin, ascorbic acid, and vitamin D. Quantitative determinations established the presence of marked vitamin C deficiency and lowered serum proteins, calcium and phosphorus. The reflections of these multiple deficiencies dominated the clinical picture. It is difficult to determine accurately the extent to which the several factors present were responsible for the deficiency state. Doubtless all contributed. Certainly the metabolic needs were abnormally high and this in an individual whose intake and assimilation of calorigenic material, vitamins and minerals were low and whose stores of these substances had probably suffered depletion over a prolonged period of time. A vicious cycle was thus established in the course of thyrotoxicosis and was interrupted by vitamin supplements, iodine and thyroidectomy.

Fig. 5
Patient E. T. Convalescent thyrotoxicosis, purpura, vitamin C deficiency.

SUMMARY

In the light of the preceding case reports it is clear that the complications of thyrotoxicosis may be quite varied. Examples are given of osteoporosis with fractures, myopathy with involvement of the muscles of respiration, ophthalmopathy dissociated from the thyrotoxic state and avitaminosis. These constitutional manifestations of Graves' disease on rare occasions may be so conspicuous as to dominate the clinical picture and obscure the underlying problem. The concept that Graves' disease is

"a constitutional disturbance involving a complicated hormonic imbalance having widespread effects in which the thyroid is but one item"

is both sound and useful. Its validity is attested to by physiologic and pathologic observations and by the occurrence of such cases as are cited herein. Its usefulness in the clinic is limited only by the extent to which it is employed in the study and treatment of thyrotoxic patients.

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STAPHYLOCOCCAL PNEUMONIA

DURING EPIDEMIC INFLUENZA IN NORTH CAROLINA (1941)*

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Influenza in epidemic but in relatively mild form, according to Smith and Menefee,[1] began on the West Coast in December and moved Eastward. It reached North Carolina about the middle of January, 1941, and continued there through February. Menefee and Speed[2] studied 227 male college students who had symptoms of epidemic influenza.

Both studies indicate that in students, hospital staff and general population, the 1941 epidemic of influenza in the North Carolina area had a high morbidity with a low mortality. After 12 to 24 hours of red and swollen nasal and pharyngeal mucous membranes, the process became manifest in the larynx and trachea and produced, in most instances, a harassing cough. Hoarseness and soreness of the trachea often persisted after all the generalized symptoms had disappeared. In hospital cases the temperature usually ranged from 38 to 41° C. A variety of organisms was cultivated from the throats of the patients. Although no attempt was made to isolate the virus, the studies of Horsfall, Richard and Lennette suggest that both influenza virus A and B were present in the 1941 epidemic.

THE COMPLICATING PNEUMONIA

Four Cases with Autopsy

In the course of this epidemic of mild influenza several cases of pneumonia developed, some of which led rapidly to death. These pneumonias presented such unusual and unforgettable appearances at necropsy, were so regularly associated with the hemolytic *Staphylococcus aureus* in cultures from the lungs, and were so reminiscent of the pneumonias which developed during the great influenza pandemic of the first World War that they deserve special consideration.

The unusual appearance consisted of extreme ulcerative tracheobronchitis associated with massive hemorrhagic and edematous pneumonia. The comparisons and contrasts with staphylococcal infections of the lung occurring in non-epidemic time will be mentioned later.

Four autopsy cases are available which appear to fall into the group just outlined. In three cases the clinical course was short, in the fourth as long as 16 days. For the autopsy data on *Case 3* thanks are due to Dr. Clarke Brown, of Watts Hospital, Durham, and the University of North Carolina.

A clear idea of the condition is best imparted by an account of the first patient who came to necropsy.

M. M. (Autopsy 3047), a nurse, 40 years of age, had mild symptoms of influenza 4 days before death, but continued her work. Admitted to the hospital 26 hours before death, she said that severe substernal pain and rapid breathing had developed shortly before. There was cyanosis of lips and nails. Approximately 18 hours before death she began producing globules of blood-tinged sputum which in smears showed clumps of staphylococci. Culture of the throat later showed growth of hemolytic *Staphylococcus aureus*, but blood cultures subsequently proved to be sterile. White count was 10,700 with 43 per cent segmented polymorphonuclear neutrophils, 42 per cent stab forms, 3 per cent J forms, 0 eosinophils, 0 basophils, 4 per cent monocytes, 1 per cent large lymphocytes and 7 per cent small lymphocytes. Sodium sulfathiazole was administered intravenously. The temperature of 102° F. on admission increased to 106.5° at death on January 22, 1941. A portable roentgenogram taken on admission showed haziness over the left lower lung field.

Gross Examination.—At autopsy the inside of the larynx (including the posterior aspect of the epiglottis), trachea, and main bronchi were covered with a reddish-gray, shaggy exudate continuous into the lung along the smaller bronchi. Near the tracheal bifurcation the exudate was patchy in distribution and flaky. The peritracheal lymph nodes were enlarged and red.

Each pleural cavity contained 100 c. c. of thin, reddish fluid.

The left lung, weighing 700 grams, was dark red. The pleura had a single dull fibrinous area over the left lower lobe. The dark red cut surface exuded blood and frothy fluid when the lung was compressed. Hemorrhagic regions several centimeters in diameter, with grayer zones centrally 1 cm. in diameter, occurred in the lower lobe and in a portion of the upper lobe, and presented the appearance of confluent lobular pneumonia. No liquefaction of these areas to form abscesses was noted. The peribronchial nodes were not remarkable.

The right lung, weighing the same as the left, showed the same hemorrhagic, edematous consolidation in the lower lobe as on the left. The right middle lobe was less involved. The pleura was smooth and glistening. The lymph nodes and bronchi were like those on the left.

The pericardium contained 100 c. c. of clear yellowish fluid. The heart weighed 200 grams. The right side was dilated, and possibly the left atrium. No myo-

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cardial hypertrophy was present. The mitral valve was definitely diseased, presenting thickening of the free margin and of chordae tendineae, but the leaflets could be moved freely. The other valves appeared normal.

Permission to examine the brain was not obtained.

The other findings are included in the anatomical diagnosis. The spleen weighed 80 grams. No abscesses occurred in the spleen, liver or kidneys.

Smear of the pleural fluid showed gram-positive cocci.

Bacteriology.—Hemolytic *Staphylococcus aureus* was cultured from right and left lungs (innumerable colonies per specimen), from liver (about 500 colonies per specimen), and from spleen, pleural fluid, and lymph nodes. Alpha streptococcus (very light growth) was cultured from both lungs. A gram-positive rod suggesting Hemophilus influenzae (very light growth) was isolated from one lung, but could not be subcultured.

Microscopic Appearances.—Microscopically, the trachea and bronchi, both extrapulmonic and intrapulmonic (except for the bronchi of the right upper lobe), presented the same appearance. The lining epithelium had been destroyed; and the subepithelial tissues were swollen and infiltrated with inflammatory cells and nuclear debris. Staphylococci, often in clumps, occurred chiefly on the surface. A differential count of the cells infiltrating the wall of a bronchus showed 87 per cent lymphocytes, 10 per cent polymorphonuclears, and 3 per cent monocytes. The deeper tissues, including the peritracheal glands, presented mononuclear types almost exclusively.

All lobes of the lungs presented about the same appearance except that the right upper lobe was least involved, without ulceration of bronchial mucosa. The necrotizing process was severest in the left lower lobe.

The reaction was composed of congestion of the walls of the alveoli with an intra-alveolar exudate consisting of hemorrhage and edema for the most part. Staphylococci, often in clumps, were present in great numbers. Necrosis of lung tissue was noted in relation to bacterial masses. In such regions early thrombi were seen in vessels, the walls of which were necrotic and infiltrated with wandering cells. But the early thrombi, and the blood in vessels elsewhere, showed essentially no staphylococci in contrast to the lung tissue. Fibrin and white cells were a less conspicuous part of the intra-alveolar exudate. A differential count of white cells in an area of exudate showed that three-fourths were lymphocytes, less than one-eighth polymorphonuclear cells, and more than one-eighth monocytes. Pleural lymphatics contained a rare clump of staphylococci, coagulated proteins of edema fluid, red cells in small numbers, and very few white cells. A count showed these to consist of one-half lymphocytes, one-eighth polymorphonuclear neutrophils, and three-eighths monocytes.

Within the afferent lymphatics and sinuses of the peribronchial lymph nodes polymorphonuclear neutrophils were abundant, in contrast to the situation encountered in the lung and air passages. A count from a peripheral sinus showed 75 per cent polymorphonuclears, 24 per cent monocytes, and 1 per cent lymphocytes. Staphylococci were not noted in sinuses or afferent lymphatics.

The spleen appeared slightly congested and more white cells occurred in the pulp than is normal. No necroses, no phagocytosis of polymorphonuclears, and no staphylococci were noted.

Sections of liver, kidney, heart, pancreas, ovary and uterus presented nothing noteworthy.

Anatomical Diagnosis.—Acute ulcerative, diphtheritic tracheitis and bronchitis. Bilateral confluent hemorrhagic and necrotizing aspiratory lobular and interstitial pneumonia (hemolytic *Staphylococcus aureus*). Serofibrinous pleurisy. Healed rheumatic mitral endocarditis. Arteriosclerosis of aorta. Multiple fibromyomata of uterus.

Comment.—The process appeared to consist of fulminating inflammation of the entire respiratory tract. The necrotizing effect upon the lining of the air passages and foci in the lungs was conspicuous. True abscesses were not present since the process was too recent, or inflammatory cells too few to provide proteolytic ferments for actual liquefaction of tissue. A direct necrotizing action of staphylococcus toxin on tissues appeared to be important about the bacterial masses. In places this affected blood vessels, producing thrombi. Hemorrhage and edema overshadowed white cell response in the exudate. The reacting cells present in air passages and lungs appeared to be lymphocytes chiefly and smaller numbers of monocytes and even smaller numbers of polymorphonuclear cells. In stating this one must be mindful of two considerations: first, that the damaged, pyknotic, rounded polymorphonuclear cell may be distinguished from a pyknotic lymphocyte only with difficulty and then not with certainty, and second, that the nuclear debris in the bronchial walls, for example, might represent disintegrated polymorphonuclear nuclei.

Autopsy culture showed organisms in the spleen, indicating that some hematogenous spread had occurred, even though the blood culture clinically failed to produce growth of the organism.

The minimal healed rheumatic endocarditis appeared to play no part in the death of the patient. There was no myocardial hypertrophy and the right-sided dilatation may have been terminal. Moreover, no congestion to speak of, either chronic or acute, was noted in the liver.

Cases 2 and *3* were very similar to the first case and do not need to be reported in detail.

Case 2 was that of a white male student, aged 17, who developed malaise and a slight cough 5 days before death on January 25, 1941. His pneumonic involvement lasted longer than that of the first patient, that is, nearly three days. The clinical course was characterized by profound prostration and a large percentage of non-segmented (immature) polymorphonuclear cells in the blood stream. Following oxygen and sulfathiazole therapy and the administration of large amounts of staphylococcal antitoxin the patient became clear mentally the day before death and appeared much im-

proved. Thirty minutes before death, however, the patient became dyspneic and cyanotic.

At autopsy the trachea was filled with a jelly-like cast of blood which was thought to be sufficient as an immediate cause of death on the basis of obstruction of respiration. Hemolytic *Staphylococcus aureus* was grown from lungs (heavy growth), spleen (moderate growth), liver and trachea. Non-hemolytic *Staphylococcus aureus* (light growth) was cultured from spleen and liver.

In comparison with *Case 1,* more localization and necrosis and more white cell response, apparently of polymorphonuclear type, were noted. The changes were consistent with a later stage of the process than in the first case, although the therapeutic agents may have had something to do with the differences. There was the development of clusters of necrotic foci. These were scarcely abscesses, since pus did not exude from them, but were more like caseous foci.

An interesting feature in this case was the presence of interstitial mononuclear pneumonia in regions devoid of intra-alveolar exudate, suggesting that staphylococcal toxin had acted on the lungs, as shown experimentally to be possible by Sprunt, Martin and Williams.[3] Another feature was acute splenic tumor, not definite in *Case 1,* suggesting that a generalized bodily effect was being produced by the toxin. Abscesses or foci of necrosis were not seen in organs beyond the respiratory system.

Anatomical Diagnosis.—Acute ulcerative, diphtheritic tracheitis and bronchitis (hemolytic *Staphylococcus aureus*). Bilateral confluent hemorrhagic and necrotizing aspiratory lobular and interstitial pneumonia (hemolytic

Fig. 1

Lining of an intrapulmonic bronchus. The swollen necrotic mucosa has lost all sign of epithelial covering. *Case 1.*

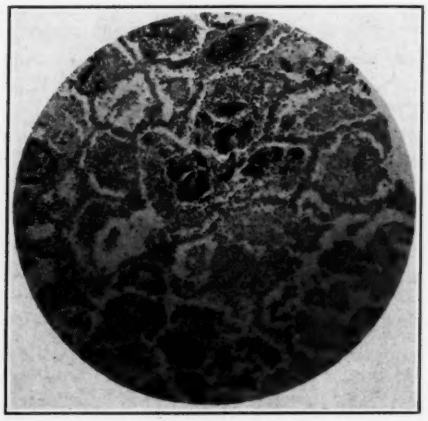

Fig. 2

Serohemorrhagic pneumonia with scanty white cell reaction. The dark staining masses are staphylococci. *Case 1.*

Fig. 3

Larynx and trachea, *Case 2,* to show the hemorrhagic necrotizing and ulcerative laryngitis and tracheitis. Staphylococcus aureus hemolyticus infection during influenza epidemic.

Staphylococcus aureus) with clusters of necrotic foci. Serofibrinous pleurisy. Acute splenic tumor. Foci of fatty change in liver.

Case 3 (*Watts Hospital A 41-2*).—This was the case of a 37-year-old white female textile worker who developed influenza a week before death and pneumonia three days before death on January 13, 1941. The gross and microscopic descriptions correspond so closely to those of *Case 2* that separate description is not necessary. The ulcerative diphtheritic character of the lining of trachea and bronchi and the hemorrhagic and edematous pneumonia were the outstanding features. The centers of the hemorrhagic areas of consolidation showed true abscess production since exudate could be scraped away. Smears from the lungs showed staphylococci in frequent clumps.

Anatomical Diagnosis.—Acute ulcerative and hemorrhagic tracheitis and bronchitis. Staphylococcal lobular pneumonia.

Case 4 (*Autopsy 3112*).—This was the case of a white male infant, aged 2 years, who died March 16, sixteen days after the onset of a "bad cold" and cough. There is perhaps some room for doubt that this case was one following epidemic influenza, because it came rather late when the incidence of cases of influenza had become somewhat reduced. However, the gross and histologic appearances were exceedingly similar to those noted in the three previous cases, and it is included with them on this anatomical basis.

Twelve days before death pneumonia was diagnosed. Following some improvement the pneumonia appeared to spread. Throat culture showed a few hemolytic streptococci and many alpha hemolytic streptococci, and it was negative for diphtheria organisms. At autopsy the right lung showed a pure culture of hemolytic *Staphylococcus aureus*.

While the type and extent of involvement in this case was quite similar to that in the adult cases, certain areas indicate, by the presence of regenerating epithelium, that the process in these foci was much older than the massive terminal one. The lymphatic vessel spread was particularly interesting. Where little abscesses occurred it seemed that suppurative lymphangitis was the proper designation. Most of the gray foci noted on the cut surface of the lung could be accounted for as bronchi with swollen necrotic lining rather than as abscesses.

Fig. 4
Posterior surfaces of lungs, *Case 2*. Note the delicate fibrinous pleurisy, the massive diffuse hemorrhagic consolidation with bulging necrotizing foci.

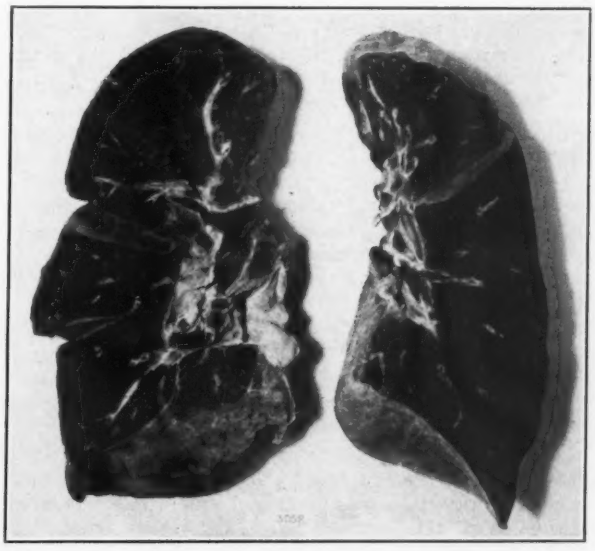

Fig. 5
Cut surfaces of lungs, *Case 2*. The diffuse hemorrhagic character of the lungs, the clusters of early abscesses, and the necrotizing bronchitis are to be noted.

Anatomical Diagnosis.—Ulcerative diphtheritic tracheobronchitis, massive bilateral confluent lobular hemorrhagic aspiratory pneumonia (hemolytic *Staphylococcus aureus*), with abscess formation and with foci of alveolar epithelial hyperplasia. Bilateral serofibrinous pleurisy.

DISTINCTIVE FEATURES

The four cases cited stand apart from the usual run of lobular, confluent lobular, or lobar pneumonia in respect to the extreme degree of associated necrotizing process in the upper air passages, the trachea, larynx and large bronchi, the extraordinary swelling and necrosis of the mucosa of the intrapulmonic air tubes, the hemorrhagic and edematous character of the confluent lobular consolidation, and of the intervening lung tissue, and the widespread and prolific growth of staphylococci. It was felt that pneumonia of this type had not been previously observed at autopsy at Duke Hospital.

It seems highly probable that the pathologic appearances observed represent the combined effect of virus and bacterium. Unfortunately no attempt was made to recover the virus from the autopsy material. However, an influenza epidemic was in progress and the cases started out with symptoms similar to those in individuals who recovered from the uncomplicated disease.

LITERATURE

The question will be asked whether other reports of pneumonia during the recent epidemic of influenza have been published. One from New England is available and the complicating pneumonia was staphylococcal.

Finland, Strauss and Peterson,[4] in a report on the use of sulfadiazine, include 29 cases of staphylococcal pneumonia (among which are 8 cases with additional organisms). Most of these cases of staphylococcal pneumonia occurred as a complication of epidemic influenza. There were six deaths in this group. Three of them had fulminating, rapidly spreading pneumonia, and died within 48 hours after admission to the hospital. At the autopsy of one of these three, diffuse hemorrhagic pneumonia with ulcerative bronchitis and multiple abscesses was found.

Another case is reported from Philadelphia,[11] with death of a nurse, on January 28, 1941. The influenza virus itself was recovered from the lung tissue of this case by ferret and mouse passage, in addition to *Staphylococcus aureus*. Excellent photomicrographs of trachea, bronchus and lung indicate the presence of the same pathologic reaction noted in the 4 cases of our series.

If we return to the several extensive and excellent studies regarding the pneumonia which developed during an attack of pandemic influenza in the time of the first World War, we find descriptions of cases which correspond closely to the cases just presented. In the frontispiece of the monograph by Winternitz,Wason and McNamara,[5] for example, there is an illustration of a hemorrhagic, ulcerative and diphtheritic tracheitis almost identical to the inflammatory process in these upper air passages in our cases. Moreover, they laid emphasis on the hemorrhagic and edematous character of the process. In their cases, the *Staphylococcus aureus* was only rarely recovered from the lungs at autopsy, and streptococci, pneumonocci and influenza bacilli were more frequently found. Whatever the bacterial invader, however, they were impressed with the same sort of massive involvement and serohemorrhagic character of the process. At the time this monograph was written it was not known, of course, that epidemic influenza was caused by a virus.

In the report by Chickering and Park[6] of pneumonia with pandemic influenza which occurred at Camp Jackson the predominant organism was the *Staphylococcus aureus*. From the article one gains the impression that the pneumonia was fulminating, that clusters of abscesses often occurred, but no clear impression is obtained of the appearance of the trachea or larger bronchi.

Apparently the secondary bacterial agent in the pandemic influenza of 1918 varied from place to place and from time to time, the pneumococcus predominating at one place, the streptococcus at another, and the influenza bacillus at another. In some instances more than one organism was cultivated from the lungs.

UNCOMPLICATED INFLUENZAL VIRUS PNEUMONIA

It is not yet thoroughly established as to what the virus of epidemic influenza does to the human lung in the absence of secondary bacterial invaders. Goodpasture,[7] in 1919, with this problem evidently in mind, described two cases which occurred during the epidemic influenza of that time in which no bacteria could be demonstrated in smears, sections or cultures of the pulmonary tissue. He regarded these as instances of pneumonia "caused by an unknown virus which gains entrance through the respiratory tract." The first of his cases, perhaps pure influenzal virus pneumonia in the light of more recent in-

vestigation, corresponds well in time intervals and in some of the main features to the cases presented today. Pneumonia, in this young robust man who became ill, commenced on the fifth day, and death occurred on the seventh day after his initial symptoms. Goodpasture writes:

> "Grossly the lungs presented the usual edematous, hemorrhagic, emphysematous condition constantly found in the very acute cases. * * * Microscopically, the lungs showed an extreme degree of injury and destruction of alveolar walls with hemorrhage, edema, a little fibrin and scant cellular exudate. The alveolar ducts were dilated and on the walls of some of them was found the typical hyaline membrane."

This hyaline membrane Goodpasture at that time considered to be pathognomonic of the pulmonary lesion of epidemic influenza. It is not at all well developed in the cases described today in the peripheral locations, but there are hyaline borders toward the lumina of the bronchi with necrotic walls. But the writer has noted hyaline membrane, in the situation described by Goodpasture, in at least one case of pneumonia in nonepidemic time, and wonders whether it is an essential feature of the pneumonia of epidemic influenza.

Information is now available on the effect of human influenza virus on the lungs of mice when the virus is given directly into the air passages. Straub[8] [9] and Nelson and Oliphant,[10] whose papers contain precise histopathological data, agree that bronchial epithelial damage is an important feature. Nelson and Oliphant produced in mice an edematous pneumonic process which was fatal in about 4 days in 80 to 90 per cent of the mice.

PURE STAPHYLOCOCCAL PNEUMONIAS

Unfortunately space does not permit further discussion of uncomplicated influenzal virus pneumonia. Let us consider the problem of the comparative roles played by virus and staphylococcus in the present cases by comparing the staphylococcal pneumonia during epidemic influenza with the staphylococcal pneumonia in nonepidemic times.

As to aspiratory pneumonia the writer has insufficient exact information, but has gained the impression that it is not often combined with tracheobronchitis and that it is focal rather than diffusely edematous and hemorrhagic. Most pneumonias due to the staphylococcus alone (and again this is an impression) are embolic and develop as an event in a staphylococcal pyemia. The pneumonia in such cases usually takes the form of multiple abscesses, and we do not usually see the massive diffuse involvement of the lung or the ulcerative process in the trachea and bronchi. How much this is a matter of the mode of entry of the organism into the lung and of the numbers of staphylococci rapidly introduced into the lung, or of the immunologic and allergic state of the individual, is difficult to say. The following case indicates how diffusely edematous and hemorrhagic an embolic pneumonia may be. An autopsy was performed by the writer some years ago on a woman who died six days after the development of a carbuncle on her shoulder and two days after the development of pyemia. The carbuncle had discharged directly into a good-sized vein, and the pus had made its way in large quantities to the lung. The time intervals and the large numbers of staphylococci suggest an analogy with the cases described today. The reaction in the lungs was one of abscess formation, to be sure, but with diffuse hemorrhage and edema approaching that in the cases which developed during epidemic influenza by the aspiratory route. In this case of pyemia there was also secondary ulceration of the bronchi close to the abscesses in a fashion much like that noted in the influenzal cases. The larger air passages were not involved, and there was much evidence of septic emboli and infected thrombus material in the blood vessels of the lung, but that is what would be expected on the basis of the different mode of entry of the organisms into the lungs.

This last case is mentioned not as characteristic of embolic staphylococcal pneumonia, but as an example of what may occur under certain circumstances. It suggests that the role of staphylococcus and virus in the cases presented is not yet clear.

To turn for a moment now from what has been to what may be, the guess may be permitted that if epidemic influenza visits this country this year, as many have predicted that it will, numerous cases will be seen similar to these which have just been reported. The sulfonamide drugs and staphylococcus antitoxin may change the situation somewhat from what it was in 1918, but a conditioning circumstance, the mobilization of large groups of soldiers in army camps, is indeed present.

It is to be hoped that the problem of separating the effects of the influenza virus on the human lung from the effects of the bacterial in-

vaders will be pursued further, and the matter clarified.

SUMMARY

During the epidemic of mild influenza present in North Carolina in the winter of 1940-41 instances of fatal staphylococcal pneumonia occurred which were very similar to the pneumonia noted during the pandemic influenza of the World War in 1918. These cases, of which four were studied at autopsy in Durham, were characterized by ulcerative and diphtheritic tracheobronchitis and massive fulminating edematous and hemorrhagic pneumonia. Hemolytic *Staphylococcus aureus* was cultivated from the lungs, and could be demonstrated in the sections of larger air passages and lungs in luxuriant growth. Necrotizing foci were present in the early cases and clusters of abscesses in the older cases. Stress is laid on the fact that staphylococcal pneumonia with this distinctive morphological appearance in larger air passages and lungs scarcely occurs except in association with epidemic influenza.

The problem is discussed of the part played by the influenzal virus and the staphylococcus respectively in the production of the pneumonia as observed at autopsy.

The evidence from the literature is presented that influenzal virus in itself is capable of producing pneumonia in man and experimental animals (ferrets and mice). On the other hand, a case of pyemia is presented by the writer in which diffuse edematous and hemorrhagic pneumonia in addition to pulmonary abscesses was apparently produced by the staphylococcus alone in the probable absence of virus. However, in most cases of epidemic influenzal pneumonia the concept of a synergistic action between virus and bacteria would appear to fit the various observations most closely.

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DISCUSSION (*Abstract*)

Dr. Henry Pinkerton, St. Louis, Mo.—First, in regard to the nonspecificity of the hyaline membrane in pneumonia, I would like to agree fully with Dr. Baker and point out that in cases of atypical pneumonia caused by the protozoan toxiplasma, which we have recently reported, the hyaline membrane was a conspicuous microscopic feature.

Dr. Baker's work emphasizes clearly a very important feature of the virus diseases in general, namely: their tendency to precede and to prepare the way for infection by a bacterial disease, and in many cases the bacterial infection may entirely overlie the virus disease in such a way as to obliterate the preceding evidence of the virus infection.

Several years ago I had occasion to study a disease in foxes, which was producing a very high mortality on fox ranches, and which had been called paratyphoid. It was characterized pathologically by the formation of microscopic abscesses in the liver, and in every way the findings were those characteristic of paratyphoid fever; however, in carefully studying sections from the livers and lungs I was able to find in almost every case a few typical inclusions of canine distemper. These could easily have been overlooked. It suggested very strongly that the distemper lesion underlay the paratyphoid; in fact, I doubt very seriously that paratyphoid fever in foxes as a primary disease ever occurs.

Many workers believe that staphylococcus is a cause of a primary pneumonia. Perhaps it is the only bacterial cause of a primary bronchopneumonia in young adults, but it seems to me that in the light of this work we must be very cautious in assuming that staphylococcus is ever the cause of a primary pneumonia. Certainly we cannot assume this unless we have very carefully ruled out the possibility that a virus infection preceded the staphylococcus infection.

I have had no personal experience with staphylococcus pneumonia, but Dr. Ralph Kinsella tells me that we had a few years ago a considerable epidemic of staphylococcus pneumonia at the St. Mary's Hospital, and I think it would be interesting to look back and see if by any chance the epidemic corresponded chronologically with an epidemic of influenza.

There seems to be a growing feeling that bronchopneumonia as a primary disease in healthy young adults is an extremely rare condition, that there must in almost every case be an underlying etiologic factor, either influenza or sometimes tuberculosis, and recently there have been a number of other possibilities brought forth.

Probably most of you have read of the virus which Weir and Horsfalls obtained from certain cases of atypical pneumonia by taking sputum to a country where the mongoose could be obtained, and injecting the mongoose intranasally.

By this method they obtained a virus transmissible from mongoose to mongoose by intranasal inoculation, but which cannot be transmitted to any other laboratory animal.

This indicates that there may be a number of viruses perhaps lying dormant in lung tissue which we cannot detect by any of the methods of study which we have at present, and it seems to me entirely possible that as we make further progress in the study of virus disease, we may find that the great majority of cases of bronchopneumonia have an underlying virus etiology.

Dr. W. A. D. Anderson, St. Louis, Mo.—As Dr. Baker suggested, we are likely to encounter succeeding epidemics of virus influenza in the near future. With the clear picture in mind of the complicating staphylococcal pneumonia that Dr. Baker has presented, we shall undoubtedly recognize many more cases. We are inclined to think of primary staphylococcic pneumonia as contrasted with the embolic septicemic pulmonary lesion as very uncommon, but we may be forced to revise this opinion.

It has been properly emphasized that the development of staphylococcic pneumonia depends upon a predisposing factor, such as a virus disease, lowering the resistance of the individual. This appears to hold true in the adult, but staphylococcal pneumonia has been reported in infants in whom there was no evidence of a predisposing virus infection. C. M. Smith, in the *Lancet* (2: 1204, 1935) reported four cases among infants in a maternity hospital. Other types of staphylococcal infections were also present in the same hospital. The lesions described in these infants were similar to those in Dr. Baker's cases.

Staphylococcal pneumonia is usually rapidly fatal. The hemorrhagic nature of the lesion is characteristic of any early stage. Abscesses are prominent if there is survival for a longer period. The necrotizing tracheobronchitis which Dr. Baker had described is a valuable observation, and one not hitherto stressed in reports of staphylococcal pneumonia. All too often such lesions may be overlooked by failure to remove the entire trachea at autopsy.

I wish to ask Dr. Baker if he has an opinion as to the exact route of infection of the lung in these cases of staphylococcal infection.

Dr. Baker (closing).—As to the mode of infection in these cases, I should surmise, without of course any real proof, that staphylococci proliferated abundantly in the larger air passages, that is, in the larynx and trachea, and were then aspirated into the intrapulmonic bronchi and alveolar spaces.

THE PRESENT STATUS OF OPERATIVE TREATMENT FOR HYDROCEPHALUS*

By ALBERT D'ERRICO, M.D.
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Hydrocephalus is a condition resulting from obstruction at some part of the cerebrospinal circulation, where the absorption of the fluid cannot equal its output. Some of these cases can definitely be cured, but these successes depend first upon early diagnosis and treatment; and, secondly, upon a thorough understanding of the underlying pathology and its relation to the fluid flow. Many operations have been devised and it is a consistent finding throughout the literature that all procedures attempting to divert the cerebrospinal fluid to any spaces or channels other than those of its normal circulation have ended in failure. Other operations by reducing the formation of the fluid or by making available the natural channels are the ones that have proven successful.

Hydrocephalus resulting from direct obstruction of the ventricular system is known as the non-communicating type. In the communicating type there is a connection between the ventricular and subarachnoid components of the circulation. Usually with the latter the pathology is diffuse, obliterating the cisterns at the base of the brain which are the main channels from which the fluid flows to the convexities, where it is for the most part absorbed. This process is not amenable to direct surgical attack, and the only practical solution is to reduce the production of the cerebrospinal fluid. Many procedures have been proposed to accomplish this. Ablation of the choroid plexus provided the simplest solution to the problem, and an open method of removal was first described by Dandy[1] in 1918. In 1922 he[2] described an attempt to fulgurate it by a closed method through a ventriculoscope, similar in construction to a cystoscope. With such an instrument the ventricles can be entered with a minimum of trauma, and collapse of the ventricular walls is prevented by maintaining the fluid pressure within. Surgical shock is thereby markedly lessened. Later more adaptable ventriculoscopes were designed for this purpose by Putnam[3] and by Scarff.[4] This procedure has more recently been perfected

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by Putnam to a high degree of safety and effectiveness and has become standardized for selected cases. While this method has been used for all types of hydrocephalus, it appears best suited to the usual communicating type or to those rare instances caused by an over-production of fluid.

A large number of cases of the non-communicating type of hydrocephalus where there is an obstruction of the internal system must be considered. In these the normal structures for fluid formation and absorption are present, but there is an intervening obstruction which must be overcome. Any procedure which could by-pass this obstruction and remain permanent would be most desirable. Such a procedure was first reported by Dandy[5] in 1922 and later developed by Stookey and Scarff.[6] A frontal exposure is made and the frontal lobe is elevated exposing the bulging anterior wall of the third ventricle. An opening is made through this and the ventricle is entered. Another opening is then made through its floor posteriorly (*Fig. 1*). A by-pass is thus provided draining the ventricular fluid directly into the cisterna chiasmatis and interpeduncularis which are main channels for distribution of the fluid to the areas of absorption. This procedure is particularly adaptable to cases of obstruction of the aqueduct by congenital atresia, by ependymitis, or by slowly growing but inoperable tumors. While a cure is infrequently obtained in these due to the nature of the pathology itself, palliative relief usually results.

There is a large group of cases to consider in which hydrocephalus is associated with an extensive malformation in the subtentorial space and in the adjacent vertebral canal. These show the same general features of the hind-brain deformity which is associated with spina bifida. This deformity, known as the Arnold-Chiari malformation, was first described by Arnold[7] in 1894. A recent comprehensive study of this condition has been reported by Russell and Donald.[8] In 1938, McConnell and Parker[9] reported a group of five cases without spina bifida which were found to have a deformity of this type. In cases of basilar impression, also known as platybasia, there likewise is found a malformation with similar characteristics. This has been well described by Gustafson and Oldberg[10] and by List.[11] Apparently all of these anomalies are the result of the same embryonic dysplasia.

There are certain features which characterize the Arnold-Chiari type of deformity and which

Fig. 1
Diagram showing how openings made in the floor of third ventricle provide a by-pass to an obstruction of the aqueduct.

Fig. 2
Photograph showing the extracranial portion of the Arnold-Chiari, malformation. The intracranial portion of the cerebellum is seen just above.

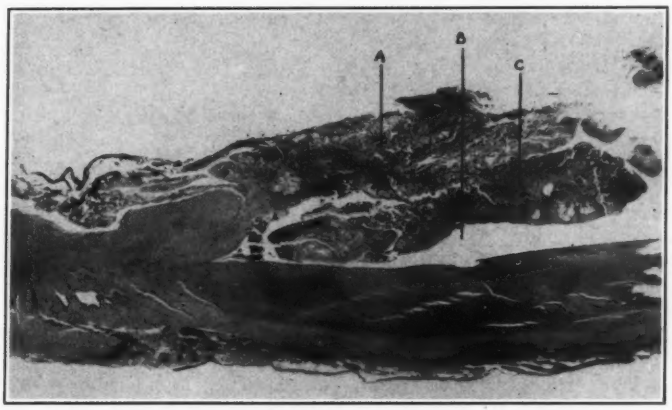

Fig. 3
Sagittal section of extracranial portion of malformation (very low power). Choroid plexus fused with the cerebellar prolongation is clearly seen almost filling the fourth ventricle. A. indicates the cerebellar prolongation; B, the fourth ventricle; and C, the choroid plexus.

play a part in the production of hydrocephalus (*Figs. 2* and *3*). The medulla is elongated, extending downward below the foramen magnum, and on its posterior surface irregular projections are seen. Over this lies a long cerebellar prolongation forming the roof of the fourth ventricle, which lies in part in the vertebral canal. The foramina of Magendie and Luscha leading from it are therefore extracranial. The leptomeninges covering the malformation are typically thickened and quite vascular and often they are bound to the adjacent dura by dense adhesions. Other frequent findings are occlusion of the aqueduct and narrowing of the fourth ventricle.

Microscopic examination shows a marked alteration of the architecture of the cerebellum and hind-brain. The leptomeninges are extremely vascular and show a collagenous thickening with a fusion of the pia and arachnoid and a marked reduction of the fluid spaces (*Fig. 4*). Small hemorrhages and pigment formation are sometimes found. The cerebellar prolongation is made up of scar tissue, islands of neural tissue, some of which have definite cerebellar structure, and choroid villi which are intermingled in the mass. The fourth ventricle is narrowed and filled with choroid plexus. This is somewhat undifferentiated and shows a rather marked fibrosis of its supporting structure.

The exact mechanism of obstruction is difficult to prove because of the variability in the structures involved. Certain points are obvious, however. The communication between the internal and the external cerebrospinal fluid system is extracranial in the upper part of the vertebral canal. Above the foramina of exit lies the mass of the malformation. Within the fourth ventricle there is an abundant choroid which often fills the narrowed cavity. This is somewhat fibrotic and may act as a plug with compression. Surrounding the entire deformity is an abnormal pia-arachnoid with increased vascularity and with marked reduction of its fluid spaces. Apparently this is due to congenital aplasia and obliteration by scar tissue. The obstruction appears most likely to be due to a combination of compression in the region of the fourth ventricle by the mass and a reduction of the fluid spaces in the leptomeninges. The ventricle is usually narrow and, the roof being thin and elongated, makes it readily compressible, resulting in an internal obstruction.

It is a known fact that hydrocephalus will

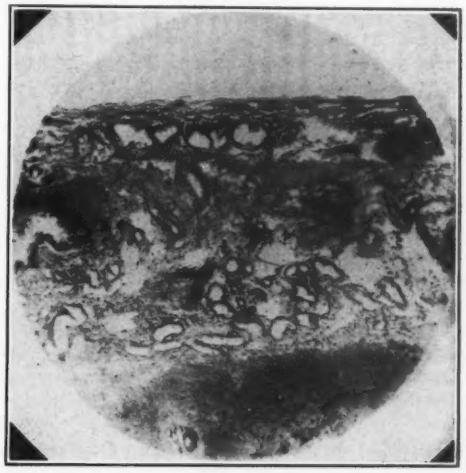

Fig. 4
Photomicrograph showing leptomeninges overlying malformation. Note increased vascularity and collagenous thickening with reduction of fluid spaces.

often appear after repair of a spina bifida defect or following a rupture of the sac. On the basis of this we have aspirated fluid from the sac repeatedly with this same result. With ventricular punctures this did not occur. On the contrary, in cases where hydrocephalus had already developed, prolonged relief was obtained. Apparently the loss of fluid from below causes the malformation to jam in the upper vertebral canal, whereas withdrawal of fluid from above relieves the compression.

Operation on the malformation was first reported by van Houweninge Graftdijk[12] in 1932. Death followed, however, and the effects of operation could not be determined. On the basis of the findings described I felt that suboccipital operation with adjacent laminectomy was most logical, and this was done in a series of consecutive cases of hydrocephalus with mylomeningocele and the results have been reported elsewhere.[13]

Prior to operation multiple ventricular punctures are done over a period of several days. This improves the condition of the patient and operation is better tolerated. A midline incision is made extending downward from the occipital protuberance, exposing the occipital bone and the laminae of the upper two cervical vertebrae. The occipital bone is rongeured away as far laterally as possible and the laminae removed. The dura is then opened and compression of the vertebral contents is usually demonstrable. The malformation is readily identified; and if it is found to extend farther below, additional laminae are removed until the entire lesion is exposed. The piarachnoid appears markedly injected and often free blood with pigment formation is found matted within. The leptomeninges are thickened and are usually bound to the adjacent dura by adhesions. These are severed close to the dura to avoid injury to the arachnoid. Dissection is then carried laterally and the malformation is mobilized. The dura is left widely open for decompression. By this means the fluid channels are allowed to fill as far as possible and the circulation is thereby improved. This procedure, when carefully performed, has a comparatively low mortality. In a consecutive series of cases the mortality rate following operation was 12.5 per cent. In addition, however, a large percentage died within the first two years of life from associated anomalies and from other unrelated causes. With careful selection of cases the operative mortality is further reduced and the ultimate survival rate is far greater. In general, those who have the most physical impairment and those who are operated upon late have the poorest results.

In all the types of hydrocephalus described, early diagnosis is essential and operation should be done before too much destruction of brain tissue has taken place. Dye injection, air studies, and repeated measurements of the head are all important. The dye test is a simple and safe procedure. After first reducing the intracranial pressure 1 c. c. of indigo carmine is injected into either lateral ventricle. The absence or appearance of the dye by spinal puncture indicates whether the hydrocephalus is non-communicating or communicating in type. Air studies are valuable, but have considerable attendant danger in the more advanced cases. We have found, however, that this danger is reduced by reinjecting the cerebrospinal fluid at body temperature into the ventricles immediately after the x-rays are taken. In infants constant observation of the fontanelles and repeated measurements of the head are important. The greatest circumference has been found to be the most practical head measurement. This should be taken at regular intervals. A comparison of these measurements with those of the normal growth curve will indicate the progress of the hydrocephalus. By the proper employment of these diagnostic measures early recognition is possible.

Many cases of hydrocephalus are not amenable at all to surgical treatment and it is important to set these apart. In some, only palliative relief can be given, but operation is certainly justifiable to prevent the disability which occurs with prolonged increase of pressure. It is important to realize that only a relatively few cases can be cured, but with proper selection a high percentage of good results can be obtained. It must be remembered that an appreciable hydrocephalus may be present long before abnormal enlargement of the head is apparent. Early study and recognition are therefore essential and as soon as a progressive dilatation is established operation should be done at once. Any surgery upon patients who already have an extreme hydrocephalus or a marked disability preventing a useful existence is certainly not justified. The obvious purpose of operation is to prevent the formation of an excessive hydrocephalus rather than to arrest it once it has formed.

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DISCUSSION (*Abstract*)

Dr. Harry Wilkins, Oklahoma City, Okla.—Dr. D'Errico has given a comprehensive review of the problem of hydrocephalus. This condition if allowed to progress soon produces irreparable changes within the brain tissues, which in the child are highly susceptible to damage by stretching, compression and vascular impairment, producing cellular anoxia. Early recognition of the condition, therefore, is of paramount importance.

Within the past few years we have included with the diagnostic measures described by Dr. D'Errico, investigation of the subdural space by aspiration, and in several cases having rather characteristic gross appearance of hydrocephalus, have encountered large collections of subdural (extra-arachnoid) fluid. This usually is blood tinged or if of several weeks' duration, exanthochromic and of high protein content. Some of these patients are relieved by aspiration, but occasionally a case will require operative treatment for permanent results.

In our experience the procedures for relief of obstructive hydrocephalus, unless due to a removable tumor, are for the most part unsuccessful. This results not alone from the difficulty in maintaining patent bypasses from ventricle to subarachnoid system but from associated malformations as well.

After a considerable wave of enthusiasm about the operative treatment for communicative types of hydrocephalus, we believe that frequently these cases may be controlled by conservative treatment. A concentration of food to reduce the total fluid intake, the use of diuretics to increase fluid elimination, and attention to position, employing gravity to facilitate venous drainage from the cranial cavity are worthy of trial.

One must be extremely watchful, and if in spite of a brief trial, the symptoms persist or tend to increase, coagulation of the choroid plexus must not be delayed. We have used the closed method, but prefer an open method in which collapse of the cortex is prevented by sealing the subarachnoid space with moist strips of cottonoid. A bipolar coagulating tip is then employed, as damage deep into the thalamic area has been demonstrated in cases fulgurated by a single active and a distant indifferent electrode.

Dr. D'Errico is to be congratulated on his work with suboccipital malformation. A great deal of this is independent of previous investigations and the operative technic is original. Our results have not been so satisfactory, probably due to our failure to use ventricular punctures.

Dr. Roland M. Klemme, St. Louis, Mo.—The first patient with whom I had contact having the Arnold-Chiari syndrome was diagnosed by me at operation as tumor of the brain stem. That was some two and one-half years ago and the patient is still alive. Evidently it was not a tumor, but gave the typical reddened appearance of an infiltrating glioma. The decompression was carried past the third cerebral vertebra. Since that time we have had three other patients.

Unfortunately the treatment of hydrocephalus with the Arnold-Chiari syndrome in my experience is applicable to a very small percentage of cases. In my group of patients it is less than 2 per cent. Whether we are missing the diagnosis I am unable to say, but certainly we have seen this syndrome in only a small percentage of patients.

I take exception to what the essayist had to say relative to platybasia. We have had two cases of platybasia in the past four and one-half months, so diagnosed by constructing Chamberlin's line. The axis in one extended three-quarters of an inch above the line and the axis on the other extended well above the line. At the time of operation these patients showed a constriction of brain stem, but there was no evidence of any malformation of the brain stem. I should like a little more information relative to the frequency of the Arnold-Chiari syndrome in platybasia. I also should like to get more suggestions on how to handle the 98 per cent of the hydrocephalics who have not this syndrome.

I do not agree with the idea of being conservative. We are here primarily to rehabilitate these individuals if we can do it, and we are justified in attempting anything that is humanly possible to accomplish our results. It is quite true the outlook at present is not encouraging but we should not sit back and say that there is nothing we can do.

I have the same attitude upon spina bifida. A case that I particularly recall was a myelomeningocele. I assured the family that the patient would never walk, and in a year and a half the patient walked into my office, much to my amazement and surprise. I think that we should make every effort to treat these patients in spite of the attitude of some referring physicians who send a note along saying, "There is nothing you can do except operate upon the child and hope it will die." A continued effort should be made to rehabilitate these patients. Further research work and further careful examinations of the material at hand as described in this particular paper I think should be carried out.

Dr. David C. Wilson, Charlottesville, Va.—You feel,

do you, Doctor, that the measurement of the head is the main method of early diagnosis?

Dr. D'Errico—In infants.

Dr. Wilson—You have nothing else to add to that, that would help us out in our efforts? Dr. Sachs, aren't you going to help us out here?

Dr. Ernest Sachs, St. Louis, Mo.—I should like to ask Dr. D'Errico whether in making the diagnosis he uses the double puncture method. I did not hear it mentioned. That is what we do. We depend upon that very largely. We gave up the use of dye in 1923, because we had trouble with high fever. Dr. Marriott was living at that time and he and I both agreed that the dye method was unwise. We used the phenolsulphonphthalein preparation that Dandy described. Now we depend entirely upon the double puncture method to determine whether we have a communicating hydrocephalus or an obstructive hydrocephalus. I should very much like to hear whether Dr. D'Errico has either not used it or has given it up for some special reason.

Dr. D'Errico (closing)—I have intentionally omitted other lesions which would cause enlargement of the head, such as subdural collections of fluid which Dr. Wilkins has discussed. A subdural hematoma or a subdural collection of fluid should certainly be considered with any enlargement of the head in an infant. The medical treatment for hydrocephalus has been mentioned. We have tried this in some instances but even where improvement has followed we have never been sure whether or not the hydrocephalus would recur. I feel that in these cases we ought to do what we can surgically without delay. With such treatment any improvement which may be gained will follow immediately.

Operation is certainly applicable to only a small percentage of cases. I believe that we should produce good results in a large number of the cases operated upon. Therefore a proper selection of cases is important and they will be relatively few in number. In reference to Dr. Klemme's statement about platybasia, so few cases have been operated upon that I do not think we can make a steadfast statement regarding the presence of the Arnold-Chiari findings. I have found them present in the cases that I have seen, and they are also noted in the reports of Gustafson and Oldberg and of List. In regard to his statement about operating upon all cases, I feel that we must produce good results in order to obtain confidence in the procedure. This will necessarily restrict the number. I have never felt gratified with cases where marked disability or extreme enlargement of the head has been retained.

In regard to Dr. Sachs' question about the double puncture, I feel that any puncture from below is likely to precipitate trouble. In using indigo carmine we have not found the fever reaction that he has described with the phenolphthalein. It may be due to this, and we have noted it before: if we do not reduce the ventricular pressure before injecting the dye the spinal puncture will cause a jamming down of the vertebral contents and fever may follow.

The operative mortality in repair of the spina bifida itself must also be considered. With proper management, however, this should not be high. This is dependent upon a thorough understanding of the cerebrospinal fluid mechanism which has been described.

CONGENITAL CHOANAL OCCLUSION*

By WILLIAM L. BONHAM, M.D.
Oklahoma City, Oklahoma

Congenital occlusion of the posterior choana is a malformation of development of the upper respiratory passages consisting in either a partial or complete bony or membranous wall between the nose and nasopharynx. From a review of the literature it would appear that some cases are diagnosed and operated upon in early infancy. Those who survive with the condition unrecognized may reach adolescence or adult life before the diagnosis is made and others may go through life without the condition being discovered.

Anderson,[1] in 1937, stated that only 160 cases had been reported since 1830, and only six cases had been seen in the Section on Rhinology of the Mayo Clinic since 1907, and in only one of these cases was the occlusion bilateral. Their first case was diagnosed in 1920 during the performance of a submucous resection of the nasal septum. In 1939 Pastore and Williams[2] mentioned 12 cases seen at the Mayo Clinic, four of which were bilateral, five right-sided and three left-sided; eight had complete bony occlusion, one partial bony occlusion, one membranous and bony occlusion, and two membranous occlusion. The youngest was one day old and the oldest 34 years.

The first case of congenital choanal obstruction was discovered by Otto in 1829 at autopsy and it was not until 1853 that the first clinical case was discovered by Emmert in a boy 7 years of age. Emmert used a curved trocar to break down the obstructing wall. In 1885 Von Scrotter employed the galvanocautery to perforate an occluded choana. Stewart[3] reported two cases of complete bilateral atresia in 1931 in sisters who had a brother who died in infancy apparently from unrecognized complete bilateral choanal obstruction. He also reported that out of 27,863 patients with disease of the nose and paranasal sinuses who registered at the Royal Infirmary of Edinburgh under A. Logan Turner and J. S. Fraser, only six cases of unilateral choanal atresia were found. Brose,[4] in 1907, reported a case of posterior choanal occlusion in a 22-year-old patient, operated upon by means of a trocar, saw and chisel, followed by the in-

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sertion of a rubber tube. Rogers[5] reports having seen three cases in 30 years of practice, one in 1897, the second in 1907, which was operated upon, but when healed the opening was so small as to cause a whistling sound when the mouth was closed and the patient was taking exercise; the third case was operated upon in 1922 with good results. Hart and Peeler,[6] in 1929, reported diagnosis of complete bony choanal occlusion in a baby 11 hours old. Eight weeks later operation was performed with punch and curettes and catheters were inserted for three weeks. Death occurred three months later from pneumonia. Stinson,[7] in 1932, reported two cases, the first in a 7-month-old baby operated upon by boring through the obstruction with a Freer submucous elevator and the second in a girl aged 14 operated upon by removing a piece of the vomer, allowing the right naris to communicate and drain at an angle into the left naris. Grove[8] reported a case operated upon in 1931, and Donnelly[9] reported an operation upon a 4-year-old girl in 1936, using biting forceps and curette and a full thickness skin graft. Kelly,[10] in 1939, reported an operation on a 20-year-old girl under general anesthesia, using a chisel and sphenoid punch and removing the posterior edge of the septum. Morgenstern[11] advised electrocoagulation at weekly intervals, in his case eight treatments being given with good results, the choana still being patent two and a half years later.

Normally the choana is bounded by the posterior border of the septum, the junction of the hard and soft palates, the medial lamina of the pterygoid process, and the body of the sphenoid. In the development of the embryo the epithelial plates which separate the nasal fossae from the primitive mouth cavity become thin membranous structures as the nasal cavities extend posteriorly, and by rupturing during the fifth or sixth week produce the primitive choanae. It is now generally accepted that congenital choanal obstruction is due to the persistence of this vestigial epithelial structure, the bucconasal membrane. This membrane is formed by nasal epithelium and stomodeal epithelium between which lies mesenchyme. In cases of posterior choanal occlusion the membrane fails to absorb and the extent of mesenchyme resorption between the two epithelial layers determines whether the obstruction is membranous or osseous.

When the congenital occlusion is complete there is inability to breathe through one or both nostrils, depending upon whether it is unilateral or bilateral. There is a widening of the nasal chambers due to underdevelopment of the turbinates. Thick glairy mucus lies on the floor of the nose and this can be removed by the patient only by bending the head forward or by irrigation. The sense of smell is impaired in unilateral and lost in bilateral occlusion. In the newborn there is marked difficulty in nursing, and a tendency to suffocation and cyanosis during sleep and when the mouth is closed.

The following is a report of two cases, the first a unilateral complete bony choanal occlusion, and the second a bilateral complete bony choanal occlusion. X-ray examination following instillation of iodized oil was done in both cases before and after operation.

Case 1.—K. S., a white girl 15 years of age, was first seen in the outpatient department of the University of Oklahoma Hospital on November 29, 1939. She was referred by her physician, who had been treating her nose and ears since February, 1939. She stated that she had never been able to breathe through the right nostril. She was unable to blow the right nostril and there was a thick mucous secretion on tilting her head forward. She had not noticed any impairment of her hearing, though she had been having pain in the ears for several months. The ear, nose and throat examination by the resident physician revealed retraction and scarring of both tympanic membranes and what he interpreted as a polyp in the right naris. Hospitalization and x-ray examination of the paranasal sinuses were recommended. Examination on January 18, 1940, revealed a large amount of thick glairy mucus lying on the floor of the right naris. No polyps were present. Posteriorly, about the region of the posterior margin of the septum, was a concave obstruction which prevented the rising soft palate from being seen when the patient said "K." The obstruction was palpated with a probe and was definitely bony in character and covered with mucous membrane. With the postnasal mirror a convex obstruction was seen completely to occlude the right posterior choana, extending from the posterior margin of the septum to the lateral wall of the nose and from the floor of the nose to the roof. This was verified by digital palpation and the nasopharyngoscope, although the nasopharyngoscope did not allow as satisfactory a view as the postnasal mirror. The patient was unable to blow any air through the right naris and no opening was seen on examination. Urinalysis, blood count and bleeding and coagulation time were normal. The Wassermann was negative. X-ray examination was made after filling the right nasal cavity with iodized oil. The report stated that iodized oil filled the nasal cavity and that there was no evidence of communication of the right nasal cavity with the nasopharynx.

On January 25, 1940, an operation was performed for removal of the choanal obstruction, using intratracheal nitrous oxide, oxygen and ether anesthesia. At this time a submucous resection of the nasal septum was performed. The mucous membrane from the posterior portion of the septum was elevated as it extended laterally over the anterior wall of the choanal occlusion. With biting and punch forceps the occlusion was removed to the lateral wall of the nose and from the floor to the roof. As the lateral wall was approached the bone became much thicker and in this area a slight ridge was left because of the possibility of injury to the

sphenopalatine vessels. No attempt was made to turn a mucous membrane flap over the lateral wall, and about one-half inch of the posterior portion of what was now the membranous nasal septum was removed. At the completion of this operation there was excellent breathing space through both nares. The patient made an uneventful recovery and was discharged from the hospital three weeks later. On April 7, 1941, the resident put iodized oil into the right naris with the head back off the table, following which an x-ray was made. The radiologist reported that the injection of iodized oil showed several ethmoid cells on the right side to be filled, but most of the opaque oil was in the nasopharynx and esophagus. The resident physician then packed strips of gauze saturated with iodized oil through the choanal opening and forward into the nose to show the patency of the posterior choana and x-ray examination was again made.

Case 2.—M. F. S., a white woman, aged 23, was admitted to University Hospital on August 12, 1941. She complained of inability to breathe through either nostril. This complete obstruction of both nostrils had been present during her entire lifetime. At four days of age a nose operation had been performed by her family physician, but she was told that the obstruction reformed within a very short time. She was unable to blow the nose, but could get the mucus from her nose by bending her head forward and wiping it. There was no history of deafness or earache, although the patient said that she had intermittent discharge from the right ear and a continuous discharge of pus from the left ear. She has seven brothers and six sisters who are living and well, and who have no nasal obstruction. Two brothers and two sisters are dead, the oldest having died shortly after birth and the other three having died at about 14 months of age.

Examination revealed chronically infected tonsils. The orifices of the eustachian tubes were normal. The posterior choanae were not present and in their place was a solid wall lying just anterior to the eustachian tubes. The larynx was negative. Anterior rhinoscopy revealed a mild septal deviation to the right. There was glairy mucus on the floor of both nares. The inferior turbinates were underdeveloped; their lower borders lay at least one-half inch from the floor of the nose. There was a complete bony wall lying just behind the posterior ends of the turbinates and extending from the lateral walls to the septum and from the floor of the nose to the roof. This bony wall was covered on both sides by mucous membrane and exhibited no openings. The patient was unable to breathe through the nose. The right ear showed an inferior central perforation just below the umbo which had healed with a thin membrane which retracted on inspiration and bulged on expiration. The left ear exhibited pus in the external auditory canal and there was a central perforation, the opening of which was filled by a polyp.

Both nares were filled with iodized oil and x-ray examination was made in the verticomental and lateral positions. This showed obstruction at the site of the posterior choanae. There was some iodized oil in the antrum and ethmoid.

On August 14, 1941, an operation was performed for relief of the choanal atresia under intratracheal nitrous oxide, oxygen and ether anesthetic. A submucous resection was performed, together with removal of the posterior portion of the mucosal as well as bony septum. The bony and mucosal choanal atresia extending laterally to the medial pterygoid plates was removed with biting forceps. At completion of the operation there was a good opening of both nares into the nasopharynx. The nose was packed with vaseline gauze. The patient had a satisfactory convalescence and on August 27 an x-ray examination, after filling both nares with iodized oil, showed the oil to enter through the posterior choanae into the nasopharynx. She was dis-

Fig. 1, Case 1
Preoperative x-ray in verticomental position shows iodized oil outlining posterior choanal occlusion.

Fig. 2, Case 1
Postoperative x-ray showing iodized oil in nose passing through posterior choana.

charged from the hospital the following day with satisfactory nasal respiration.

Fig. 3, Case 2

Preoperative x-ray in verticomental position with head off table shows iodized oil filling both nares and outlining bilateral choanal occlusion.

Fig. 4, Case 2

Preoperative x-ray in lateral position with iodized oil in nares. Some oil has entered antrum and ethmoid.

SUMMARY

The existence of this abnormality should be made known to obstetricians, pediatricians and general practitioners in order that an early diagnosis may be made and the lives of some infants saved. The greater the number of cases reported in general medical journals, the larger

Fig. 5, Case 2

Postoperative x-ray in verticomental position with head off table showing iodized oil in both nares and nasopharynx.

Fig. 6, Case 2

Postoperative x-ray in lateral position with head flat on table shows iodized oil passing into nasopharynx and esophagus.

will be the number of physicians who will become informed regarding this defect. The diagnosis is relatively simple if one is cognizant of the existence of such a condition and will use a probe, catheter, postnasal mirror and digital palpation of the nasopharynx. This may then be followed by x-ray examination after instillation of iodized oil into the nasal cavities. The type of surgical treatment will vary with the age of the patient, since the operation employed in these cases obviously would not be applicable to infants and children. In such cases the submucous resection of the nasal septum would be omitted and the operation would otherwise be the same.

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DISCUSSION (*Abstract*)

Dr. Philip J. Bayon, New Orleans, La.—Based upon the number of reported cases, congenital atresia of the posterior choanae must be considered a very rare occurrence. There can be no doubt that a number of cases of bilateral occlusion of the posterior nares occurring in the newly born who die of asphyxia or inanition are never recognized. Except in these, the symptoms, as Dr. Bonham has outlined, are neither remarkable nor dramatic, but the diagnosis is simple and it seems reasonable to suppose that those cases that do survive are to a large extent discovered at some time or other.

Aside from its rarity, it is curious that this condition is found preponderantly in the female. Of the cases in the presentation you have just heard, you may recall that where the sex is mentioned it occurred only once in the male; both of Dr. Bonham's cases were females; and during 1940 Dr. LeJeune and I saw three cases in the office, all occurring in females.

The method of operation has varied considerably, but it seems definitely established that simple excision of the obstruction is usually not sufficient. Of the successful procedures, perhaps the most generally performed is the one which Dr. Bonham has described; and his results certainly leave nothing to be desired. Morganstern's use of diathermy coagulation in successive stages has been satisfactory and because it is simple, reasonably safe and can be performed entirely as an office procedure, it must be strongly recommended.

In the interval between April and December, 1940, we saw the surprising number of three cases in the office. As I have said, all were females. The first was 7 years of age. The obstruction was present on the left side and was bony in character. Under ethylene-ether anesthesia, the obstruction was perforated with sphenoid and large dental burrs and the opening enlarged with punch and biting forceps.

One month later, the opening had almost closed. Under sodium ethyl thiobarbiturate anesthesia, the stenosis was reopened and the edges were coagulated with a ball-pointed diathermy electrode. On two subsequent occasions the edges were lightly coagulated in the office with little discomfort to the patient. When she was last seen, six months after the second operation the result was entirely satisfactory.

The second case occurred in a girl aged 16. The obstruction was bony and bilateral. In 1931, an attempt at correction of the right side was made. The nature of the procedure is not known, but presumably it consisted of a simple perforation. Under sodium ethyl thiobarbiturate anesthesia, the obstructions were opened and enlarged with burrs and biting forceps and the edges treated with diathermy coagulation. Subsequent office coagulations, twice on the left and once on the right side, were required to maintain large openings. When the patient was last seen, nine months after operation, both sides were well open.

The third case occurred in an infant of 3 months. The obstruction was on the right side and appeared to be bony in character. Becaue of her age it was considered advisable to defer operation.

In our cases it is true that in addition to an operative procedure supplementary office treatment was necessary, and it is possible that the posterior submucous resection may have accomplished a satisfactory result with less postoperative attention; but the idea of diathermy coagulation appealed to us and the outcome has been happy. In the first case, after the initial attempt had failed, it was felt that a series of diathermy coagulations would be difficult because of the age of the patient. Hence the decision to create a large opening with the hope that the coagulated edges would remain patent.

The second case was treated in a similar manner because of the encouraging results of the first.

Dr. L. Chester McHenry, Oklahoma City, Okla.—I have personally operated upon but one patient with congenital choanal occlusion. This was a unilateral membranous occlusion and was opened by simply punching out the membrane. The opening was then maintained by persistent use of silver nitrate upon the granulating margins.

I think that Dr. Bonham's method of electrocoagulation is excellent. The technic that Dr. Bonham uses in doing a posterior resection of the septum so that one has a mucous membrane covering the medial margins of the openings eliminates a great deal of the difficulty caused by granulations.

Dr. John H. Foster, Houston, Tex.—All congenital posterior occlusions are membranous to begin with. Later they become bony. If they are opened and dilated early, that is all that is necessary to cure them.

I got that idea from an article in the *American Journal of Pediatrics*. I saw a baby with this trouble and carried out that procedure, simply opening the membranous occlusion and using dilators and having the patient come back regularly for a time. I used frontal sinus dilators, passed them through it very readily, kept the baby under observation for three or four years, and it has remained open.

TRANSPLANTS TO THE THUMB TO RESTORE FUNCTION OF OPPOSITION: END RESULTS*

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Warm Springs, Georgia

The maneuver of thumb opposition is a normal function frequently impaired due to muscle weakness resulting from an attack of poliomyelitis. This aftermath makes it impossible for the patient to bring the pad of the distal phalanx of the thumb into position to oppose the other digits. In the presence of this weakness the thenar eminence is atrophied. The thumb metacarpal can be easily outlined under the overlying skin. The palm is wider due to extension and external rotation of the thumb metacarpal. The grasping ability of the hand is decreased to the extent that its function more nearly simulates that of a hook. The finer and more skilful movements characteristic of the normal hand are lost.

The complete maneuver of thumb opposition is made up of four component movements. These movements appear in the following order:[1]

(1) Abduction of the thumb from the palmar surface of index finger.

(2) Flexion of metacarpophalangeal joint.

(3) Rotation of metacarpal and phalanges. The degree of rotation increases proximo-distally.

(4) Adduction of the abducted thumb across the palm toward the ulnar border.

In addition to these four component movements the thumb metacarpal is drawn toward the fifth metacarpal when the transverse carpal ligament is tightened by the action of the palmaris longus: "cupping" of the palm.

The combination of these movements serves to move the thumb from the radial border of the index finger across the palm toward the ulnar aspect. As the thumb moves across the palm the pad of the distal phalanx of the thumb rotates through an arc of 90°. Although thumb opposition is usually considered a movement brought about by intrinsic muscles of the thenar eminence, there are three extrinsic muscles that take part in this movement. These are the flexor, extensor, and abductor pollicis longi muscles. Since the transplant to be discussed is designed to overcome only intrinsic muscle weakness, ample functional strength in these three muscles is a prerequisite.

A basic transplant that satisfactorily fulfills the mechanical requirements of intrinsic muscle action is shown in *Fig. 1*. This transplant is not being presented as an original procedure. The pull of the transplanted tendon on the thumb in the direction of the pisiform bone to provide the desired adduction and the point of attachment of the transplanted tendon to the thumb to provide the necessary rotation are two important mechanical principles previously described by Bunnell.[2] The use of the flexor sublimis of the fourth finger as the transplant was originally published by Mayer[3] and later by Royle.[4] The most important features of these previous works, supplemented by other points of practical importance, have been combined in one basic procedure. This procedure is being presented as an effective means of restoring the loss of function of opposition caused by poliomyelitis. It is termed a basic transplant because it is done in every case as a basis for the means by which opposition can be restored. It can function alone or can be used as a basis for the incorporation or attachment of other available extrinsic muscles on the flexor aspect of the wrist.

The advantages of this basic transplant are as follows:

(1) The strength of a portion of the flexor sublimis muscle is made available as power for opposition.

(2) Additional incisions elsewhere, to secure a piece of tendon or fascial graft, are eliminated.

(3) The added procedure of doing an end-to-end anastomosis between tendon and free graft is eliminated.

(4) The danger of adhesions' forming at the pulley site is lessened.

(5) It is much easier to obtain the proper

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amount of tension on the transplanted tendon at the time of operation.

Five features incorporated in this transplant are of sufficient mechanical importance to merit special emphasis.

(1) The course of the transplanted tendon from the muscle belly to the pulley must be in a straight line.

Angulation predisposes to the formation of adhesions. The added friction decreases the motor power destined for the thumb.

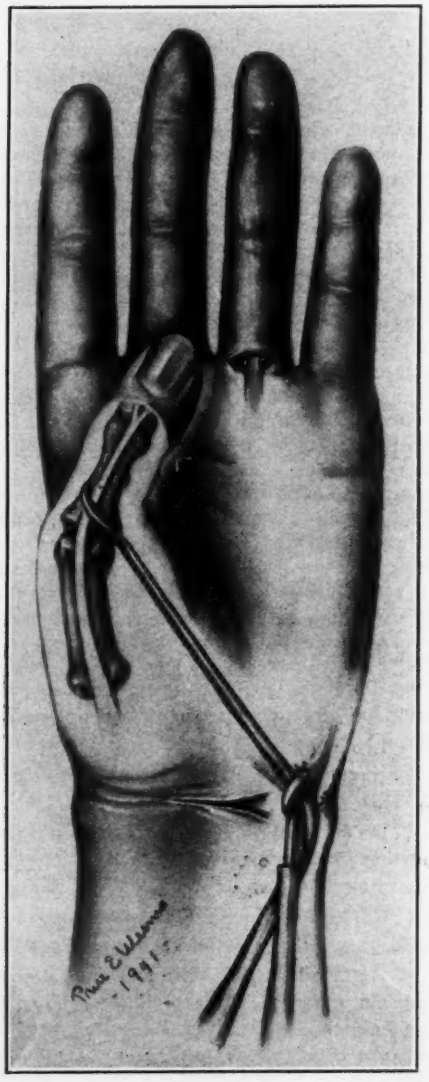

Fig. 1
Basic transplant.

Fig. 2
Recurrence of external rotation and abduction. The pulley site has shifted upward and medially.

(2) The pulley must be so constructed that its original position will remain constant.

A pulley constructed by simply passing the transplant under and over the flexor ulnaris tendon will not always remain in its original position. As the transplant increases in strength the tendon will often creep upward on the flexor ulnaris tendon. As the ulnaris tendon bows to the radial side the pulley site is displaced upward and medially. The length of the transplant remains the same, but the distance it spans, as it passes through the pulley to the thumb, is shortened. The resulting loss in tension is evidenced by the decrease in the desired degree of adduction and rotation of the thumb (*Fig. 2*). The pulley site can be maintained in a fixed position by constructing a hitch from a portion of the flexor ulnaris tendon as shown in *Fig. 3-A*.

(3) The pulley must be so constructed that it will allow free gliding movement of the tendon.

The transplant comes in contact with only smooth glistening surfaces on the inside of the pulley. The inside diameter of the loop should be one-third larger than the diameter of the tendon it accommodates (*Fig. 3 A*).

(4) The tendon must lie in front of or toward the flexor side of the metacarpophalangeal joint as it passes to its insertion in the base of the proximal phalanx.

If the tendon passes to the extensor side or even directly over the metacarpophalangeal joint the phalanges will hyperextend and the head of the metacarpal will be depressed. This is particularly true in the presence of decreased intrinsic flexor power and normal extension.

(5) The tendon is fastened directly in the bone, entering the proximal phalanx of the thumb on the border adjacent to the web (*Fig. 3 B*).

The tendon pulling from this point of insertion produces the desired rotation of the distal part of the thumb when the transplant is under tension.[2] By passing the tendon through bone a firmer attachment is insured and early physical therapy can be instituted without fear of stretching or tearing. The use of crutches or canes when necessary for weight-bearing puts this transplant under such a strain that attachment in bone is almost imperative.

REINFORCED TRANSPLANTS

Other flexor muscles are not incorporated with the basic transplant unless it has been necessary to arthrodese the radiocarpal joint. The palmaris longus is never removed from its normal site to another position for the purpose of furnishing motor power for a transplant. It normally takes part in opposition. In the presence of a fused wrist the flexor ulnaris or radialis can be used to reinforce the basic transplant (*Fig. 4*). The secondary tendon must be attached to the tendon of the basic transplant proximal to the pulley.

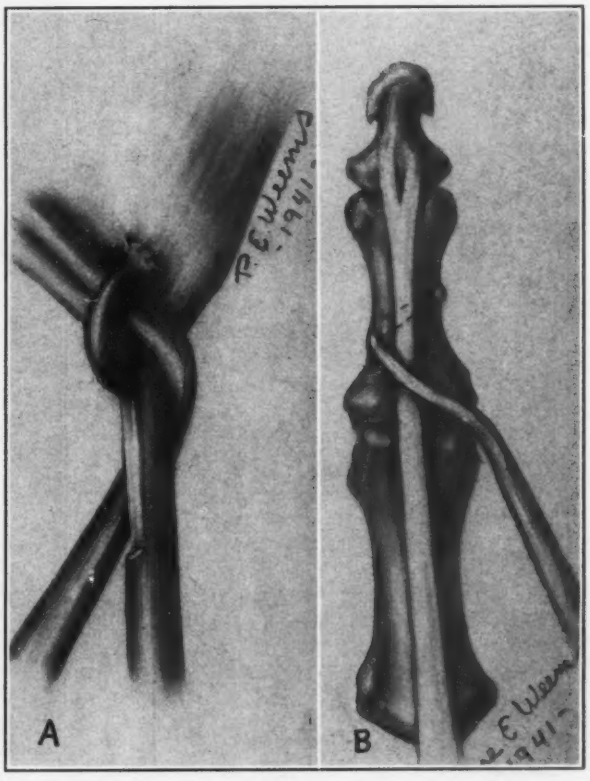

Fig. 3
A. Detail of pulley construction. B. Attachment of tendon into bone.

TECHNIC OF OPERATION

The operation is performed under a general anesthetic. A blood pressure cuff is used for a tourniquet. Only three small incisions are necessary.

The first incision is made transversely in the flexor crease at the base of the fourth finger. The tendon sheath is split longitudinally and strips of umbilical tape are passed around each slip of the flexor sublimis tendon. The tendon slips are not divided at this time.

A second incision is made in a flexor crease at the wrist. The incision begins at a point over the palmaris longus tendon and is extended medially and over the flexor carpi ulnaris. Care is taken not to section the palmaris longus or to injure the median nerve in the lateral angle of the incision. Injury to the ulnar artery and nerve in the medial angle of the incision must be avoided. The flexor sheath is opened by blunt dissection. The tendon to be transplanted can be identified by flexing and extending the extended finger at the metacarpophalangeal

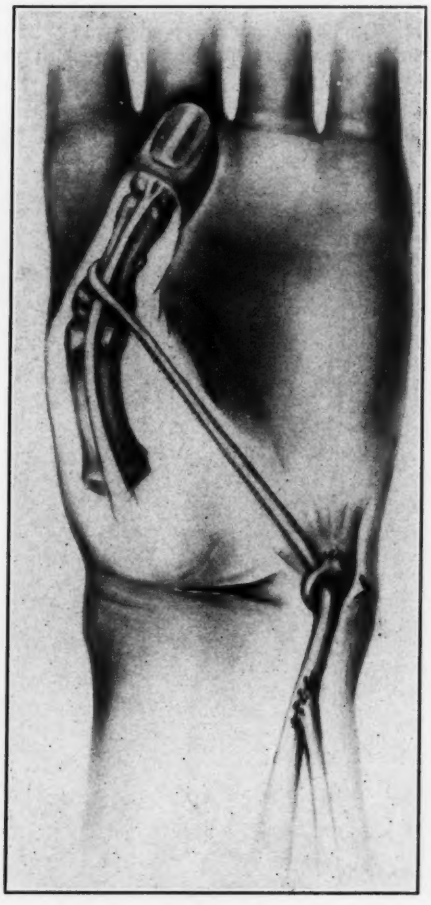

Fig. 4
Reinforced transplant.

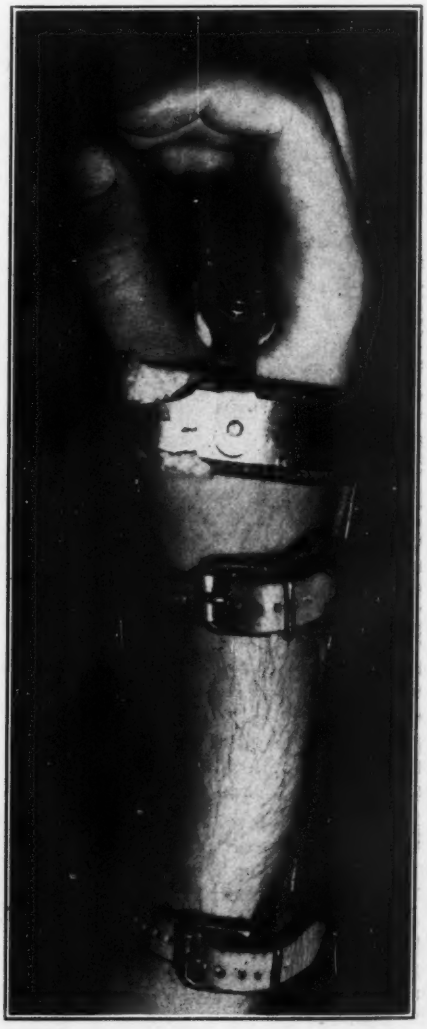

Fig. 5
Splint to hold thumb in opposing position and to limit wrist motion.

joint. When the tendon has been identified and lifted out of the sheath the distal slips are divided and the tendon withdrawn from its compartment. The flexor carpi ulnaris tendon is exposed for a distance of 1½ inches proximal to its attachment. The pulley is constructed as shown in *Fig. 3 A*.

A third incision is made parallel to the long axis of the shaft of the proximal phalanx of the thumb. This incision is made on the border adjacent to the web. The shaft is exposed subperiosteally, two silk sutures are fastened in the edges of the divided periosteum. These sutures are used for retraction during the operation in this area and are so placed that they can be used to anchor the tendon after the distal end has been passed through the bone. A small drill hole is made through the shaft. This hole can be enlarged to the desired diameter with a curette or burr. The tendon is next passed through a subcutaneous tunnel made through the thenar space. The distal end of the tendon is slit and a portion of correct diameter is passed through the drill hole. Through a stab wound the tendon is passed to the opposite side of the phalanx. The desired amount of tension on the transplant can be secured at this time.

No attempt is made to close the tendon sheaths. All incisions are closed by silk placed as mattress sutures. Postoperative scars are negligible. The hand is immobilized from axilla to tip of fingers, elbow flexed, forearm in supination, thumb in opposing position, and fingers straight.

CONTRAINDICATIONS

Certain contraindications are listed below. If these are not respected, satisfactory end results will not be obtained.

(1) Absence of power of functional value in the extrinsic thumb extensors, flexors, and abductors.

(2) Absence of ample function in one or more fingers to oppose the thumb once it is brought into position by a transplant.

(3) The attempted use of muscles from the extensor aspect of the forearm.

The pathway they must course to reach the flexor aspect is so tortuous that they are bound down by adhesions.

(4) Unbalanced or unstable wrist.

A wrist which is dropped or deviated to the radial or ulnar side should be stabilized surgically before the transplant is done.

(5) Contracture of thumb in radial adduction and extension.

The metacarpal should be easy to abduct passively from the palm to the full extent of the web and underlying muscles without resistance.

(6) Limitation of motion in the metacarpophalangeal joint.

Motion is often limited to extension in thumbs that have not been properly splinted during convalescence. Unless these contractures can be corrected and the full range of flexion be restored by physical therapy, the transplant should not be done.

(7) An arthritic hand or one in which there is a general limitation of motion in the fingers, whether from immobilization or disuse, is not suitable for transplantation.

POSTOPERATIVE TREATMENT

The postoperative dressings are removed at the end of seven days and physical therapy started. The thumb is kept in proper position by a splint made and fitted before operation (*Fig. 5*). This piece of apparatus splints the thumb in all desired positions except rotation.

For the first two weeks the splint is not removed for physical therapy and treatment is directed at increasing the motion in the interphalangeal and metacarpophalangeal joints. The pad of the distal phalanx of the thumb is rotated toward the palm to its full extent.

At the end of two weeks the splint is removed for physical therapy and the patient is taught to use the transplant voluntarily.

The thumb is splinted for a total of six weeks. At the end of this time the apparatus is removed entirely.

END RESULTS

Good	12
Fair	4
Poor	3
Total	19

Cause of Fair Results in Four Cases

Thumb contracted in extension and radial adduction	2
Limitation of flexion in metacarpophalangeal joint	1
Insufficient strength in long thumb flexor and finger flexors	1
Total	4

Cause of Poor Results in Three Cases

Attempts to use muscles from extensor aspect of the forearm	2
Faulty technic, tendon pulled loose from attachment to thumb	1
Total	3

The basic transplant will give universally good results in properly selected cases if one adheres to the points of practical importance stressed above.

One is probably justified in doing the operation for a fair result. The four patients who experienced only fair results were well pleased with the improvement in function and appearance. The surgeon should be able to anticipate such a result and familiarize the patient with its limitations.

Poor results can be avoided by proper selection of the case.

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DISCUSSION (*Abstract*)

Dr. Paul C. Colonna, Oklahoma City, Okla.—The author has made it clear that while the muscle transplant technic he has employed is an effective operation, there must be preoperatively ample functional strength in the extrinsic muscles of the thumb and in one or more of the opposing fingers. In addition, balanced action of the wrist must be sustained and if not initially present must be obtained by muscle shift or by an arthrodesis.

He has pointed out the fact that while the transplant of the flexor sublimis tendon of the ring finger is the basic procedure, this may be reinforced by employing certain other available flexor muscles, but that any use of the extensor group will prove unsatisfactory.

Unquestionably, hand surgery requires unusual attention to technical details. This operation with its pulley action has been well conceived by Meyer and also by Bunnell, but the necessity for preoperative muscle power for restoration of joint mobility before operation has been reemphasized to us today in a most careful manner.

Any report that can offer to restore good or fair power to the paralytic abductor intrinsic thumb muscles in sixteen out of nineteen cases is to be regarded as a valuable contribution in the treatment of a very disabling deformity.

Dr. Irwin (closing).—I am extremely sorry we are unable to show the film, because a subject of this nature cannot be well presented unless we can show the results in motion. If you observe the various technical points presented, you will get surprisingly good results from this particular transplant.

THE SURGICAL MANAGEMENT OF COLONIC CANCER*

By CURTICE ROSSER, M.D., F.A.C.S.†
Dallas, Texas

The colon, an increasingly frequent site of malignancy, is a favorable site from the surgical standpoint because wide removal of involved and potentially invaded tissue is mechanically possible without impairment of subsequent health or function. Despite a continued regrettable lag between onset of symptoms and discovery of the lesion, the operability rate is now much higher than that found for comparable rectal tumors.

Within recent years few surgical conditions have received the benefit of as much study and consideration as has colonic malignancy. Preoperative preparation has been revolutionized and there have evolved surgical procedures which are simultaneously more radical, more clear-cut and therefore more simple of execution. Various methods of combating intraperitoneal and abdominal wound infection are being evaluated, and while still in the experimental stage, these chemical and technical devices offer definite further protection to the patient.

Six years ago I reported an analysis of 100 cases of cancer of the colon from the records of Baylor University Hospital in Dallas,[1] supplemented by comparative statistics from 1,564 case reports compiled by others. Several conclusions were drawn from the data then assembled. There is a uniform parallel in the location of neoplasms of the colon, more than one-half being found in the descending colon and sigmoid, one fourth in the cecum and ascending colon and approximately one-fifth in the mid-colon. There is an arresting and almost constant symptom complex characteristic for each location: anemia and afebrile "appendicitis" on the right; indigestion, colic or diarrhea in the mid-colon, and continuous or intermittent afebrile constipation, colic or diarrhea with blood-stained stools when the growth is in the left colon.

Examination of the records at that time dis-

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closed a tendency to operate in these cases too hurriedly, without definite diagnosis and complete preparation. For example, the preoperative diagnosis in 22 per cent of the patients with cancer of the right colon was appendicitis and in one-half of the surgical deaths from tumors of the right and mid-colon the preoperative diagnosis was incorrect or indefinite.

The composite symptomatology of the group indicated that more than 40 per cent presented evidence of obstruction (constipation, colic, distension) and other reported statistics gave even higher percentages. Diarrhea, which may also be produced by obstruction, was present in approximately one-fifth of all individuals with malignant lesions of the colon.

More recently Patterson and Webb[2] have reported that nearly one-half of patients with colonic tumors in the Roosevelt Hospital showed some obstruction and they quote Hartwell as stating that three-fourths of a collected series of growths in the splenic flexure were acutely obstructed when seen.

A further series of cases has been analyzed with special reference to the mechanical factors contributing to this predominance of obstruent symptoms and to correlate them with the actual management of the condition.

The first resection of a portion of the colon for tumor was reported a century ago by Reybard of Lyon;[3] the two ends of the bowel were united "directly and immediately" by the surgeon. Immediate anastomosis following excision of segments of the large bowel continued to be practiced until 50 years ago, when Bloch, of Copenhagen, gave the first account of the application of the principle of exteriorization to intestinal surgery. During this same period Paul, Maydl, Schede and Mikulicz[4] adopted and modified Bloch's technic and there emerged from the joint surgical experience of the entire group what is now called the "Mikulicz procedure." This term is commonly applied to any operation involving mobilization, the fashioning of a "double-barreled shotgun" out of the afferent and efferent loops, the prompt or delayed resection of the growth outside the peritoneal cavity, the subsequent removal of the partition by pressure and the final closure of the colonic fistula.[2] During the past 50 years the exteriorization plan has been renovated and improved, particularly by Rankin,[5] to permit removal of larger areas of the colon, glands and mesentery and with its present radical technic has gradually received the approval of most of those engaged in intestinal surgery.

From time immemorial surgical procedures have presented an almost rhythmic tendency to reiteration and return to past practices and it is quite apparent from present medical literature that the pendulum is beginning to swing back to the first half century period and that we may expect a renewed enthusiasm for primary anastomosis after bowel tumors are resected. Already several surgical authorities have announced their defection from the group favoring multiple procedures, and with the addition of the sulfonamides to the surgical armamentarium an additional incentive for immediate anastomosis has presented itself.

The present discussion is by no means an argument for rigidly standardized procedures in surgery of the colon, which would be neither desirable nor possible. It seems reasonable, however, to survey the advantages which have been gained by graded operations and particularly from the application of the principle of exteriorization, weigh them against the recognized disadvantages and determine whether a more or less complete abandonment of the Mikulicz plan is desirable.

Our own present conclusions are based upon an analysis of 50 consecutive instances of cancer of the colon (excluding the rectosigmoid and rectum) which have come under the recent observation of Dr. Jack G. Kerr and myself. With few exceptions the operable tumors were removed by exteriorization or other graded procedures; and it is hoped that a survey of even this small group may illustrate some of the problems involved.

It is interesting to note that a large percentage were regarded as operable. Sixty-two per cent of these individuals had tumors which had not progressed to a stage of frank inoperability; we feel fortunate if one-half of the rectal cancers we see are still in a favorable stage. It should be explained, however, that liver involvement is no longer regarded as a bar to resections of the tumors; as Lahey[6] has said:

> "The position that the radical removal of the growth should be undertaken in the presence of liver metastases has been quite universally accepted by all who are dealing with these cases in any considerable number because death is delayed and is much less distressing."

In 1938, partly for this reason, 88 per cent of the colonic cancers at the Lahey Clinic were resected.

Of our 31 operable cases there were three deaths (9 per cent), where the growth was resected; although two other patients who were being prepared for resection by preliminary procedures did not survive. Many of the smaller group of unfavorable cases came to the hospital acutely obstructed and, as might be expected, the mortality in this group from the various palliative operations performed was much higher. We were interested to find that there was a rather definite preponderance of tumors in the lower grades of malignancy (*Table 1*), the percentage being higher than in our rectal cancers; analysis of 100 cases of the latter which have come under our observation[7] demonstrated that only 69 per cent were in these more favorable grades.

COLONIC CANCER, 50 CASES

	Annular Growth Per Cent	Grades I-II Per Cent	Grades III-IV Per Cent
Right colon	22	60	40
Mid-colon	66	57	43
Left colon	68.6	80	20
Entire group	60	76	24
100 cancers rectum, rectosigmoid		69	31

Table 1

The 50 cases were also analyzed from the standpoint of obstructive phenomena. Twenty-two per cent of the tumors on the right side were annular, 66 per cent of those in the mid-colon were mechanically obstructing and the percentage was even higher in the left colon. It is quite commonly believed that growths in the right colon are uniformly non-obstructive in character, but this has not been our experience (*Fig. 1*).

Obstruction may, of course, be caused by other factors than constricting growths. Large tumors may block the lumen and small growths may intussuscept. Bargen, Cromar and Dixon,[8] for example, reported that 11 of 14 tumors less than 2.5 cm. in diameter, situated above the sigmoid flexure, caused obstruction by intussusception. The presence of any degree of unrelieved obstruction has been conceded to contraindicate single stage operative procedures. The frequency of the obstruent syndrome in individuals with colonic tumors may not be disregarded in planning their surgical management for, as Tiffany bluntly stated: "Resection in the face of obstruction is fatal."

As Fallis[9] says, the Mikulicz resection (and other graded procedures) may not exemplify brilliant surgery, but at least they represent safe surgery. Fallis has called attention to the necessity to plan the type of operation suitable for the patient at the time of the first examination and not be misled by possibly evanescent improvement from preoperative preparation. He reports that at the Henry Ford Hospital they have resected the right colon of 28 patients in the past five years, using the Mikulicz plan on 15 and primary resection on 12, with a mortality of 10 per cent made up entirely from cases in the primary resection group.

Lahey[10] has been so impressed with the Mikulicz plan that all his colon resections are performed in this way. To illustrate the comparative safety of the procedure, Rankin[5] has reported a series of 31 consecutive cases with only one death. In the past, primary resection and anastomosis have carried a mortality of from 20 to 35 per cent, while exteriorization entails a mortality of from 10 to 20 per cent. Whether the use of the oral or intraperitoneal sulfonamides will change these statistics remains to be seen. Theoretically the mortality in both procedures should be reduced.

Fig. 1

Annular tumor of the ascending colon removed in two stages: ileocolostomy followed by resection of terminal ileum, cecum, ascending colon and hepatic flexure.

It is indubitably true that the trend in surgery for tumors of the rectum and rectosigmoid is toward one-stage procedures. It should be recalled, however, that obstruction in the lowest portion of the bowel is better tolerated by the patient and that mechanical decompression from below may be accomplished in a much more satisfactory and effective manner. I feel for this reason, if no other, that graded procedures may not be abandoned where obstruction is present above the area where a catheter can be inserted through the tumor and below the area accessible to the Miller-Abbott tube.

The principle arguments against exteriorization procedures and multiple operations are the longer period of disability, the possibility of cancer implant in the abdominal wound, the necessity for a temporary colostomy and possibly some technical restriction to sufficient excision of tissue. The danger of malignant implant was eliminated by immediate removal of the tumor, and in the present radical technic which Rankin terms "obstructive resection," the amount of bowel, mesentery and glands removed is limited only by the timidity of the surgeon. The other objectionable factors can be minimized, but not obviated. The period of colostomy-life may be considerably abbreviated by the recognition of certain facts: the colostomy may be opened safely in twenty-four hours, particularly if a collar of vaseline gauze supplements the clamp in retaining the bowel on the skin level (*Fig. 2*). The crushing clamp may be applied in from seven to twelve days after the exteriorization and need not be left on until it falls into the dressings, as we have found that necrosis oc-

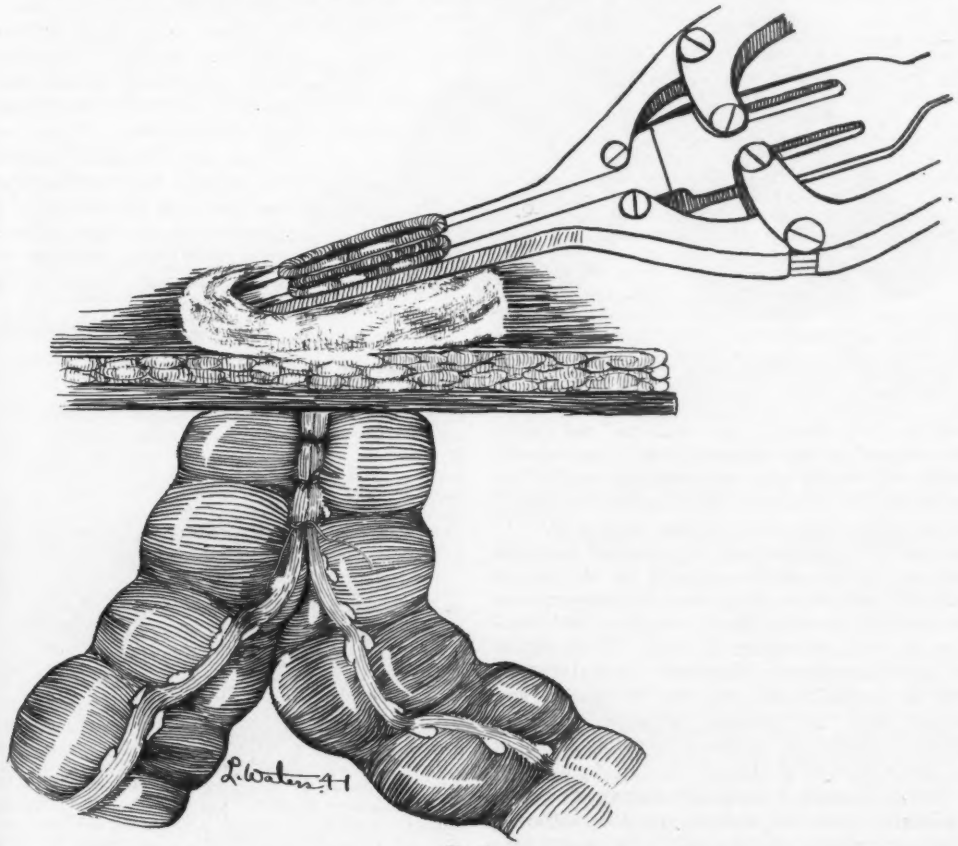

Fig. 2

The Rankin "obstructive resection." Note collar of vaseline gauze which retains bowel at skin level after release of clamp.

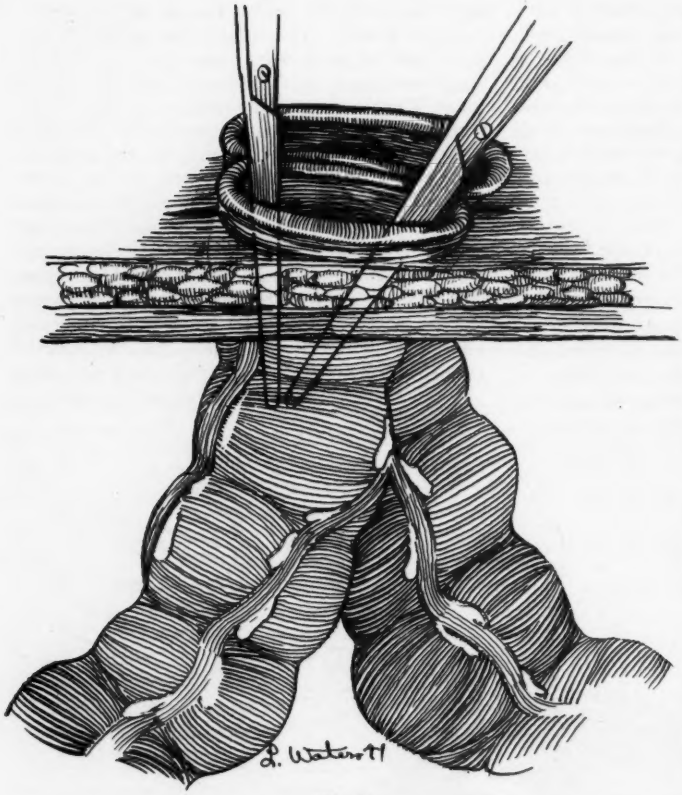

Fig. 3
Crushing of spur. Ochsner clamps will not slip even if applied early and may be removed after four days.

curs in from three to four days and the clamp may therefore be removed after that interval (*Fig. 3*). If the spur is completely excised, by reapplication of the clamps if necessary, partial rectal elimination occurs without long delay. If the resulting fistula is in the sigmoid area the patient, in my opinion, should be allowed to carry it sufficiently long to permit opportunity for closure without additional surgery, which occurs in a fair percentage of cases. If the fistula is above the sigmoid, however, surgical closure will be necessary and need not be delayed any longer after the primary operative procedure than is required to obtain a favorable situation in the wound (*Fig. 4*).

Our own series of cases are too recent to justify deduction concerning ultimate outcome; although 76.9 per cent of the operable cases which survived operation are still alive, 45 per cent for periods of from two to five years. Patterson and Webb[2] believe that 54 per cent of their cases have been cured by this type of procedure and W. J. Mayo[2] reported the same percentage of five-year cures in 262 resections by exteriorization.

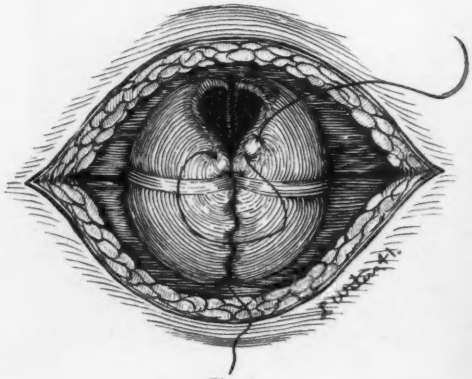

Fig. 4
Surgical closure of temporary colostomy. Note the Connell "in-out-and-over" suture.

SUMMARY

The colon is a comparatively favorable site for cancer surgery; colonic tumors are, on the average, of a lower grade of malignancy and the operability rate is higher than for cancers of the rectum.

There is a more or less constant symptom complex characteristic for colonic cancer which varies according to the location.

An analysis of 50 consecutive cases discloses that the majority of the tumors are such as to produce mechanical obstruction, because of being annular, bulky or by intussusception.

In the presence of any degree of unrelieved obstruction, graded operations present distinct advantages. The

morbidity associated with exteriorization may be minimized by prompt release of the colostomy stoma, prompt application and removal of the crushing clamps and prompt surgical closure of the resultant fistula.

One-stage procedures are frequently justified for cancer of the rectum because acute or chronic obstruction is well tolerated in the lowest portion of the bowel and mechanical decompression from below is effective; obstruction by colonic tumors is not well tolerated, decompression by the Miller-Abbott tube or enemas is often ineffective and multiple procedures will continue to be indicated for these reasons.

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DISCUSSION (*Abstract*)

Dr. Walter A. Fansler, Minneapolis, Minn.—More than forty years ago Mikulicz said that early cancer of the colon had no symptoms, but it was the symptoms of the complications of cancer which brought the presence of the growth to clinical attention. These symptoms are those of bleeding or obstruction. Symptoms of obstruction in almost every instance indicate a well-developed lesion which has been present for some time. This is not true of bleeding. Flat lesions do no bleed until they are well developed, but pedunculated lesions usually bleed early while they are still small, and in many instances before metastases have occurred. In fact, if the clinician is on the alert for bleeding, he can many times discover pedunculated lesions while they are still in a precancerous stage.

I do not believe we should accept a defeatist attitude concerning the early diagnosis of colonic cancer and wait for symptoms of obstruction and bleeding before we consider the possibility of the presence of cancer. Rather we should consider the possibility of cancer when the patient presents symptoms ordinarily associated with functional conditions, such as vague pain, spasm, irregularity of bowel habit and the symptoms which Dr. Hirschman discussed.

X-ray examination should be used much more frequently and the physician should not be discouraged because most of the cases will present negative findings. Better a hundred negative plates than to overlook one early lesion where the patient's life can be saved. Small lesions may be overlooked even with x-ray, but it is the best and only method we have for making a positive diagnosis.

Most of us have considered a colonic lesion of an inch or less in diameter as an early lesion and we have expected a better prognosis than with those that are larger. I was surprised to see the results tabulated in Colmer, Bargen and Dickson's paper which reported 61 colonic carcinomas less than an inch in diameter. All of these cases were easily operable, but permanent cure resulted in only 46 per cent, which is the same percentage as was obtained in their entire series of operable colonic cancers, which included a great number of much larger, and apparently less favorable tumors.

This report would seem to indicate that we should be a little more guarded in the prognosis than we have been in the past. Furthermore, in each instance we should probably remove a larger segment of the adjacent mesentery than we would ordinarily think necessary.

Dr. Rosser has mentioned the tendency to revive the operation of primary resection with immediate anastomosis in carcinoma of the colon. So far as I am concerned, I believe this is poor surgical judgment, and before too long the swing will be back to two-stage procedures with or without exteriorization.

Most of the men who are advocating resection with immediate anastomosis are limiting their cases to the patients who are the better risks, that is, patients who have not obstruction, who are not too fat, whose mesentery is not too short, and where there are no other mechanical difficulties. In these favorable cases, surgeons who are especially skilled in anastomosis of the intestines can secure what seems to be favorable results. But on closer analysis is this really true?

Reported mortality averages about 7 per cent. This is not high, but it must be remembered that these are selected cases, and I think we are perfectly justified in asking that, if these same selected cases had been operated upon by a multiple-stage method of exteriorization, would not the mortality rate be even more favorable?

I am sure the average surgeon who does only an occasional operation upon the colon will have far better results if he does not dabble too much with primary anastomosis.

Dr. Rosser has pointed out the better mortality rate which has been obtained in recent years. A little of this may be due to better operative technic and improved materials to work with, but I agree with Dr. Rosser that most of it is due to better preoperative preparation and postoperative care.

Careful physical examination and laboratory examinations are necessary, and from this should be determined the nature of the surgical procedure best suited to the particular individual and the type of anesthetic indicated. Other things being equal, there are three things which we have found clinically of the greater value. First, no patient with obstruction is operated upon other than as an emergency measure to relieve obstruction. Colostomy is better than cecostomy. It is seldom possible to clear the colon of stool through a cecostomy.

Second, the restoration of body fluids, minerals, and vitamin balance.

Third, where the patient is anemic, blood transfusions sufficient to restore the hemoglobin level above 75 per cent.

Postoperatively I will indicate four important things.

First is nasal suction. We use suction routinely in all cases of obstructive resection and the suction is begun immediately after operation. We do not wait for signs of distention.

Second, in obstructive resection we feel it is important to puncture the colonic stump within twenty-four hours. In times gone by we waited two or three days, and there were often abdominal rumblings worse than an oncoming thunder storm. Despite care there is often some impairment of the blood supply in the stump of the colon which is brought out through the abdominal wall. If this is the case, distention with gas further embarrasses the blood supply, and one is more likely to get necrosis at some point in the bowel wall than if early egress of gas is allowed.

The third thing is postoperative transfusions. These should be used almost routinely. They seem to be indicated at two especial times. The first is the day of operation, and second, the third or fourth day postoperatively. About this time there seems to be a lag in the condition of the patient and a transfusion is often of great help.

Fourth is the use (and not the abuse) of fluids. A few years ago there was a very definite tendency to give too much fluid, especially by the intravenous route. I am sure that more harm than good resulted. Twenty-five hundred to 3,500 c. c. of fluid in twenty-four hours is ample in most patients. In older patients, 1,000 c. c. of intravenous fluid is enough and it should be given very slowly. Given too quickly or in larger amounts the heart may be embarrassed. The remaining fluid should be given subcutaneously.

Too much normal saline should not be used. One thousand c. c. of normal saline contains about 0.9 gram of sodium chloride and this amount alone is a low normal intake. Too much salt will produce edema and waterlogging of the patient. Additional fluid should consist of glucose in distilled water, or plain distilled water. A simple and practical rule is to give sufficient fluid to maintain a urinary output of 800 c. c. or more in twenty-four hours.

These things may be termed routine basic treatment. Other conditions or complications are considered as they arise.

Dr. William H. Daniel, Los Angeles, Calif.—In treating any lesion of the colon, one must consider the physiologic and anatomical structure. J. Frazer, in the 1938 *British Journal of Surgery,* said: "The beginning of the colon simulates the small intestine in its function, and peristalsis is more vigorous in the distal colon. Mucin-producing cells are more abundant in the distal colon, and may have a bearing upon the greater incidence of cancer." Lockhart-Mummery, in *Surgery, Gynecology and Obstetrics* of February, 1938, said that in performing anastomoses strict attention must be paid to the blood supply; and that the method of joining the ends is not of primary importance. He does not favor anastomosis with clamps because of the remaining diaphragm and gangrenous tissue. Temporary colostomy or cecostomy should be performed. In heavy patients, he prefers the Paul type of operation.

In cancer of the sigmoid, or other parts of the colon, it has always seemed logical to remove the tumor and to re-establish the continuity of the bowel extraperitoneally, and I have performed the Mikulicz type in practically all cases.

With the advent of the sulfa drugs the danger of peritoneal infection has become lessened, but we should not sacrifice safety for speed of operation or a shortened hospital stay. In a direct anastomosis, any distention of the colon would naturally put a severe strain upon the suture line, and even though the contents of the bowel are made less harmful by drugs, it is still much safer to relieve the pressure by cecostomy, by incision of the sphincter, or the retention of a large mushroom catheter in the rectum.

It has been my opinion that in the exteriorization operations the growth should be removed at once; and that the bowel should be opened early. It is my practice to use a special clamp which allows a mushroom catheter to be placed into the bowel lumen at the time of operation, which allows the escape of gas early and prevents distention of the colon. There is no danger of wound infection from bowel contents if the wound has been adequately closed. Due to the use of steel wire in closing the fascia, and the use of sulfanilamide, wound infection is less frequent.

Dr. W. Kress McIntyre, St. Louis, Mo.—With the advent of the sulfonamides there will be the tendency for the doing of more primary resections of the colon, with the resulting increase in mortality. Personally, I feel we should accept these drugs as another helpful adjunct to our armamentarium in colon surgery, remembering that in the large majority of cases graded procedures are still the method of choice. The mortality in obstructive types of resection in competent hands averages between 7 and 10 per cent at the present time. This percentage could be reduced with the addition of preliminary cecostomy. I have instituted this procedure as a routine preliminary to abdominal-perineal resections in fair risk cases of cancer of the rectum. I do not feel that primary aseptic resections with complimentary cecostomy of the left half of the colon are often warranted. When such a procedure seems advisable, it should be preceded by a transverse colostomy.

Dr. Louis J. Hirschman, Detroit, Mich.—May I bring up one point, the primary resection closure? Many of these cases fail because if there is any obstruction the gas tension on the suture is likely to cause leakage.

We have a simple procedure which we have been using whether the patient has had a preliminary decompressing cecostomy or not, where we have excised and performed primary anastomosis in a number of cases in the descending and sigmoid colon. When we have completed our anastomosis, just before we are ready to close the abdomen, one of our assistants takes a long colon tube, into which we have made several additional openings, and pushes it up through the rectum. We grasp it as it passes up to the point of anastomosis and milk it through the anastomosis. Whether it is an anastomosis of sigmoid to sigmoid or an ileosigmoidostomy, we work the tube through from inside three or four inches, and then it is left there.

The result is that if there is any accumulation of gas the drainage tube is through the anastomosis, up beyond to a point where even the Miller-Abbott often will not descend. By this procedure we have been able to save some cases that otherwise might have succumbed from gas pressure tension on the sutures and leakage.

It is a simple procedure if done while the abdomen is open.

SOME PITFALLS IN PROCTOLOGIC DIAGNOSIS*

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Proctology is a field in the practice of medicine in which to the unwary the obvious is not always the correct or complete diagnosis. The well-known propensity of the patient to diagnose any symptoms pointing to the anal canal as "piles" and then indulge in self-treatment is so well known to proctologists that comment is superfluous.

If it were not for the fact that the proctologist is not infrequently called upon to correct mistaken and distorted conclusions, drawn either from a recital of symptoms or improper interpretation of findings made after examination by physicians, a paper on this subject would be uncalled for.

HEMORRHAGE

Unfortunately, all patients do not present textbook symptoms and too often many of these symptoms seem so obvious that further examination is deemed unnecessary. In many instances tragedy stalks in the wake of these so-called "obvious" cases. The appearance of hemorrhage at the anal orifice, however slight, is often a symptom which can very easily lead a physician astray unless a complete proctologic examination is an important addition to the general physical and roentgenologic study.

Bleeding is associated in some minds only with internal hemorrhoids. While bleeding occurs in many cases of internal hemorrhoids, it is unfortunately also true that hemorrhage accompanies many other more complicated and grave conditions of the anus, rectum, and colon. Ulceration, either single or multiple, of any portion of the large intestine, may manifest its presence by the appearance of blood with the stool. If mucus, pus or liquid stools are also present, too often the conclusion is hazarded that the patient has "bloody flux," "dysentery," or "some type of food poisoning."

The persistence of blood in the movements, even after a patient has been operated upon for hemorrhoids and discharged, has frequently led to the discovery of a far more seriously diseased condition, which ofttimes was situated within reach of the examining finger. In a number of instances, patients seen in consultation after puzzling hemorrhage following anorectal operations, have proven to be afflicted with a malignant neoplasm or polyposis which should have been diagnosed easily before the hemorrhoidectomy was performed.

Physicians have apparently overlooked the fact that the presence of hemorrhoids or other anorectal disease does not preclude the complicating co-existence of malignancy. By the same token, the presence of an adenocarcinoma, easily demonstrated in the lower portion of the colon, does not necessarily mean that there may not be other primary growths higher up. This would indicate that every patient in whom a carcinoma has been found within the field of visual exploration should also have the benefit of a complete roentgenologic examination of the entire bowel.

Neoplasms of the stomach and small intestines are often the origin of hemorrhage. The blood in these cases is usually dark in color. Hemorrhage of a bright red character may be caused by either benign or malignant neoplasms of the anorectal region, colonic polyposis, ulcerative colitis, amebiasis or colitis of bacterial, parasitic, traumatic, or focal infective origin.

It is not uncommon, after roentgenologic therapy of contiguous organs, that a fibrotic infiltration of the colonic mucosa occurs which produces traumatic hemorrhage often difficult to control. The impulse to diagnose internal hemorrhoids as the source of bleeding noted on anorectal examination even though hemorrhoids are present is an important proctologic diagnostic pitfall.

DISCHARGE

Another symptom which can easily lead the unwary astray is the presence of pus. Pus may appear as a discharge from the anus, or it may be seen emerging from an opening in the integument somewhere in the perineum or in the sacrococcygeal region. The natural inference, when one notes a purulent discharge from an opening near the anal orifice, is that an anal fistula is present. In the majority of instances, this is probably the correct assumption. However, a discharge in this region may originate in an abscess or infected condition affecting the urethra, prostate, or bladder, in the male; and in the female patient, it may originate from an infection of a Bartholin's gland, vaginitis, cervicitis,

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or abscess of the perineum or may descend from one of the pelvic organs.

A pitfall not to be overlooked is a discharge originating from an infected pilonidal cyst or sacral dermoid with channels leading down to the immediate vicinity of the anorectal canal. A supra levator abscess, in either male or female, may burrow, rupture, and drain through the perianal skin. Abscesses originating as far away as the hip joint, the pleural cavity, and even diseased spinal vertebrae have gravitated to and drained in the perianal region.

Abscesses of a grave type which originate in the fallopian tubes, the vermiform appendix, and in the *cul-de-sac* of Douglas, have ruptured into the rectum and pus has been discharged from that viscus. We reported, a number of years ago, a tubal pregnancy which ruptured through the rectum and in which fetal bones were discharged along with blood and pus from the anal orifice.

Stercoral ulceration, as well as trauma caused by foreign bodies, will not infrequently produce a pustular rectal discharge. It is always advisable to inject an opaque substance, such as iodized oil, barium, or bismuth paste, into the external opening from which the pus emerges, and to obtain stereoscopic films of the area. In this way, pitfalls in the diagnosis of fistula can be avoided.

PRURITUS ANI

Ulcerations and irritation of the skin in the perianal region are often the sole etiologic factors. Frequently, ulcerations are accompanied by pruritus ani and as well as burning, pain, and tenderness.

While pruritus ani has a multitude of causes, it is important to study the possibility of contact dermatitis before reaching the conclusion that the pruritus is due to the presence of hemorrhoids. In fairness to the profession, it should be stated that this conclusion is not reached by the physician as often as by the patient. Do not start any form of treatment for pruritus until the presence of fungus has been definitely verified or eliminated. An ulcer in this region, which does not respond to ordinary treatment, should always be suspected of being venereal (syphilis, lymphopathia, or chancroid), or malignant. An epithelioma or scirrhous carcinoma often originates in just this way. Pediculosis (not always in clinic patients) must also be borne in mind.

TUMORS

In the digital examination of a patient who may have any or many of the above mentioned symptoms, the presence of a large, hard mass may be merely a fecal impaction in the sigmoid felt through the rectum. On the other hand, in the female patient, the presence of a rounded "tumor" of the anterior rectal wall, particularly if umbilicated, may be nothing but the uterine cervix felt through a markedly relaxed rectovaginal septum.

There are still some physicians who depend upon digital examination alone for the diagnosis of the presence of internal hemorrhoids. The fact that they cannot feel these hemorrhoidal tumors indicates their absence. Many skilled proctologists cannot feel internal hemorrhoids.

There are some who still fall into the error of calling acute thrombotic hemorrhoids "prolapsed internal hemorrhoids." They endeavor forcibly to insert or "replace" these hemorrhoids within the anal canal and often cause unnecessary and severe pain to the patient in this attempt. If everyone would remember that a hemorrhoid covered with skin is an external hemorrhoid, and one that is largely or entirely covered with mucosa is an internal hemorrhoid, the error of attempting to force an external hemorrhoid into the anorectal canal would not be committed.

FOCAL INFECTION

Patients who present themselves to the general practitioner with symptoms of focal infection, such as myositis, neuritis, arthritis, dizziness, vertigo, digestive symptoms of various types, and unexplained dermatitis, may trace the origin of their symptoms to a focus of infection. While this focus may be located in the teeth, tonsils or accessory sinuses, a focus may also be found in the prostate, appendix, gallbladder, or the large bowel.

Many symptoms which used to be considered as originating from constipation or intestinal stasis and called auto-intoxication, were really foci of infection. The colon is the largest focus of infection in the body. Its outlet, at the region of the crypts of Morgagni, is a very active focus of infection when diseased.

It is illuminating, often dramatically so, to witness the relief of symptoms of a general character after the eradication of infected crypts of Morgagni. Anal cryptitis is an extremely fertile source of focal infection and probably the most often overlooked focus.

In our studies of stool and crypt cultures, we have been able, on many occasions, to obtain pure cultures of the streptococci which are generally credited as being the guilty factors in focal infection. Abscesses, sinuses and fistulas, in this region of the body, are also often accompanied by symptoms which are recognized as those originating from some infective focus.

This pitfall, even if overlooked by the general practitioner, should not be responsible for the failure of the proctologist to come to his aid in the study of focal infection. This whole session could profitably be spent upon a discussion of focal infection of proctologic origin.

CRYPTITIS, PAPILLITIS AND TRAUMA

Along the same line, the presence of foreign bodies and trauma of the crypts of Morgagni or the anal papillae are often overlooked, but important factors in the production of symptoms of great discomfort, either local or general. Small seeds, bran, popcorn, toothbrush bristles, splinters of bone and eggshell, apple cores, and various other indigestible and swallowed foreign bodies may lodge in any of the crypts and set up an inflammatory process. If the patient also has hemorrhoids, which many of them do, the hemorrhoids may be blamed for the condition and palliative measures instituted which would not help remove the causes.

Anal papillae are prone to fibrosis and sometimes grow to an astounding size. In personal practice, we have seen a hypertrophied papilla larger than the patient's thumb. This had become prolapsed and also torn at its juncture, at the anal canal, causing much distress and suffering. This accident, while unusual, is not uncommon.

The average hypertrophied papilla is, of course, much smaller than the one just mentioned, but often 10 to 20 times the size of a normal one. It is easy to visualize the tearing down of this fibrotic resistant structure, particularly during the passage of a hard, constipated stool or the sudden imperative expulsion of a liquid, irritating bowel movement. The symptoms produced by a tear at the base of a papilla will simulate that produced by anal fissure or ulcer.

Occasionally, trauma of a crypt by a small swallowed foreign body will cause this same group of symptoms, and on examination may not be immediately discovered. When a patient presents symptoms of tenesmus or sphincter spasm, every crypt should be carefully examined to avoid this pitfall.

ALTERED STOOLS

A relaxed sphincter may frequently lead to the erroneous diagnosis of diarrhea because of the interference with fecal retention. A fecal overflow may be misinterpreted by the patient as "diarrhea." An examination by a competent proctologist will, of course, disclose the fact that there is some interference with normal muscle tension. While this may be due to a local injury or lesion involving some of the nerve supply of the sphincter, it may follow trauma of various types. One must not overlook the factor of onanism or unnatural sexual practices, as well as some spinal diseases or those of the central nervous system which may cause sphincteric relaxation and ataxia.

Sometimes, sphincter relaxation is caused by the injudicious use of the bivalve speculum as an examining instrument or the over-distention of the sphincter during a rectal operation, usually under general anesthesia.

Another source of fecal overflow may be postoperative stenosis, the result of incomplete or improper aftercare following rectal surgery. Bands of cicatricial tissue may stenose the canal or bind the sphincter so as to prevent its complete function. As a result of the efforts of the colon to overcome this obstruction, a hypersecretion of mucus will occur and the patient suffers from considerable fecal leakage. As has been mentioned above, the irritative presence of a fecal impaction may also produce symptoms translated erroneously as diarrhea.

COLITIS

When one approaches the subject of colitis, dangerous ground may be trodden upon. There are so many factors which may cause a disturbance of, or interference with, the normal peristaltic rhythm, that extreme care must be exercised in the study of so-called "colitis" patients in order to avoid dangerous pitfalls.

There are many patients who make their own diagnosis of "colitis" and a sizable group in our own profession are prone glibly to misuse the term "colitis," like the mantle of charity, "to cover a multitude of sins."

That best seller, "San Michele," written by Dr. Axel Munthe a number of years ago, was a well recognized sign of the times. There are so many conditions which produce colonic unrest or dysfunction that a careful study of the patient should always be made in order to avoid a very dangerous pitfall. A large number of people who suffer from some type of interference with their colonic activity, which may be either

actual or psychic, have been easy victims of the so-called "colonic therapists."

In every city of any considerable size, colonic flushing stations are almost as common as the corner filling station. In addition to well-meaning but over-zealous members of our own profession, we find osteopaths, chiropractors, hydropaths, nurses, bath house attendants, barbers, ex-orderlies, and out-and-out charlatans all engaged in that highly profitable racket and indoor sport of flushing out the great American colon.

There are many patients who suffer from true colitis, whether caused by a specific organism or continued local irritation. Errors and indiscretions of diet, alcoholic excess, over-indulgence in food containing so-called roughage, all may produce colitis. The same may be said of metallic and food poisoning, hypercatharsis, exposure to wet and cold or unduly prolonged retention of fecal material.

Parasitic and bacterial infection of the large bowel undoubtedly causes specific inflammation of this organ, and whether this disease is known as colitis, dysentery or chronic diarrhea, it must be treated by specific means. The patient who exhibits symptoms of colonic unrest is entitled to the utmost amount of thought, investigation, and skill, during the study and management of this case.

So many patients are being seen by those especially interested in the treatment of the diseased bowel, because of their symptoms of disturbed colonic function, who are not suffering from a specific form of "colitis," that it is time that a warning note was uttered against this pitfall.

The colon is a movable, muscular, tubular organ which, in order to function properly, must be free and untrammeled. Anything which mechanically interferes with its function will make itself manifest by certain definite symptoms. Anything which irritates the colon, whether this irritant is obstructive or not, will produce a definite reaction. This reaction is evidenced by an increase in the two forms of colonic activity, secretion and peristalsis.

When a patient presents himself with a history of frequent bowel movements containing mucus, blood, pus or other abnormal material, he is apt to make his own diagnosis of "colitis" and unfortunately too often the physician falls in line with the same diagnosis without further investigation. There are many pitfalls for the unwary because of the fact that the public is "colon conscious."

I wish to recall a few diseased conditions which produce these symptoms as a warning against a hasty diagnosis of "colitis," without a thorough investigation into the history and habits of the individual. If the story of the patient brings out a history of previous attacks of constipation, the occurrence of fecal impaction, a previous stormy confinement, or of an abdominal operation or injury, these are of prime importance. A history of so-called hemorrhoids, fistula or other local anal condition, is extremely valuable in making a diagnosis.

The presence of fecal impaction by its mechanical irritation, and often excoriation, of the mucous membrane, will produce an increased effort on the part of the bowel to expel it, which is evidenced by hypersecretion of mucus and repeated painful attempts at defecation.

The irritation of the mucous membrane caused by the frequent and erratic stools produced by over-generous doses of cathartics in the misguided self-treatment of constipation, will often cause symptoms erroneously diagnosed as "colitis."

The partial incontinence or ataxia produced by an early tabes should also put one on one's guard. Every patient who presents symptoms of increased colonic activity should have a complete proctologic examination from the anal orifice to the sigmoid colon. In addition to this, a personal fluoroscopic examination, after the administration of an opaque enema is imperative. I say personal, because plates or films alone, no matter how excellent, are of little value in the diagnosis of a so-called "colitis," due to a pathologic condition, which interferes with the motility of the colon. The physician who is to treat the patient should, in conjunction with the roentgenologist, see and manipulate the colon under direct vision with the aid of the fluoroscope.

By far the majority of cases of so-called "colitis" which one meets are in women, and the great majority of these have previously had either a disturbed confinement or some abdominal operation. Many of these patients, on proctologic examination, will show no evidence of colonic disease, except that hyperemia which is produced by, and is not the cause of, frequent stools.

A colon which is firmly fixed in an unnatural position and is distorted, angulated or obstructed by adhesions to some other organ, or to the ab-

dominal wall, cannot empty itself properly. The presence of this obstructing lesion calls upon the organ for an increase in its physiologic activity, which is evidenced by distention, colicky pain, and the frequent passage of flatus, stools, and mucus. The patient will also evidence the other symptoms produced by any affliction which interferes with elimination, digestion, and assimilation.

If a patient having the above mentioned symptoms possesses an abdominal scar, whether or not it is depressed, he will undoubtedly have some colonic adhesions.

Many of these adhesions are caused by the diseased conditions found on operation, but some are produced as a direct result of the operation. Many surgeons who are troubled by the intestines' protruding during an operation under a general anesthetic dispose of this annoyance by forcibly packing the bowels out of the way by means of gauze pads, either dry or wet. If there is any one thing which irritates the delicate and sensitive serous coat of the bowel, it is the contact with gauze pads. If the intestines were never touched by gauze, but protected from the gauze pads by rubber dam, many adhesions would be prevented.

If, to eliminate the disturbed respiration produced by gas or ether, one would more often use spinal anesthesia, the annoying protrusion and popping out of the intestines would be entirely avoided.

I have been using a very simple method in the diagnosis of postoperative or other abdominal adhesions under the fluoroscope. During the administration of the opaque enema the abdominal wall is palpated. Any points which are tender, or at which the patient has previously located painful symptoms, are particularly watched and manipulated during the progress of the enema.

A previous attack of appendicitis or diverticulitis or any other pelvic inflammation will often cause adhesions which later interfere with proper colonic function and produce the symptoms of "colitis." In a patient having an abdominal scar, it will frequently be found that the "colitis" is caused by fixation. By grasping the scar and tugging while observing through the fluoroscope, it is easy to observe the strain or lines of stress caused by the adhesions and the demonstration of these adhesions later when the operation is performed under spinal anesthesia is so accurate as to be almost uncanny. This class of patients presents by far the greatest proportion of cases of so-called "colitis."

The confusion between the many cases of colonic dysfunction and those of actual colitis which has disturbed many patients as well as many members of our own profession, is my only excuse for devoting time to a discussion of this particular pitfall.

The differential diagnosis of diseases of the colon invokes much more detailed study on the part of the proctologist than an evaluation of the symptoms of many anorectal diseases. While most of the affections of the anus, rectum, and lower portion of the sigmoid colon are within the range of anoscopy, proctoscopy, and sigmoidoscopy, colonic diseased conditions cannot be satisfactorily diagnosed without the valuable assistance of the radiologist.

In conclusion, I wish to leave this thought in your minds: let us reverse the dictum of our criminal courts of law, that the culprit is deemed innocent until he is found guilty. In our diagnostic study of proctologic patients, let us always suspect the unusual and the more complicated conditions even when we observe what appears to be the obvious condition.

The pitfalls in proctologic diagnoses are many and varied, and in the time at our disposal, I have mentioned but a few. Let us always be on our guard and remember that "Eternal vigilance is the price of safety."

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DISCUSSION (*Abstract*)

Dr. Herbert T. Hayes, Houston, Tex.—An incomplete examination is often made because the importance of a very careful history is not emphasized. I recently did an abdomino-perineal resection upon a man who had been sent to one of our leading surgeons with a diagnosis of cancer of the anus and a polyp of the rectum, but because the surgeon did not take time to go into this man's history very carefully he removed the polyp and missed the early cancer. This gave the patient a false sense of security and he wasted a whole year before he came to us for operation for the cancer.

We do not have x-rays of the colon made unless we get a lead from the history or the examination, but we make it a point to advise an x-ray examination of the colon in every case where the patient gives a history of blood on or in the stool or of having passed bloody mucus. The x-ray examination may be negative, but if the patient persists in passing blood this should be repeated in a few months and if still negative, an exploratory laparotomy must be strongly considered.

Examination of the rectum should be thorough and wherever possible a proctoscopic examination should be done. This will reveal any malignancy in the lower 10 inches as well as other pathologic conditions.

We can make mistakes in our examinations for fistula, colitis, hemorrhoids, and so on, and the trouble may be rectified, but we should take a careful history, make a careful local examination and x-ray examination, and we will not be likely to miss the malignancies of the colon and rectum. For if we miss them our mistakes cannot be readily rectified.

Dr. George F. Eubanks, Atlanta, Ga.—In the past two months I have had two cases of purulent seminal vesiculitis. Dr. Hirschman's plan of the opaque medium has enabled me to make an accurate diagnosis, whereas otherwise I might have plunged around and probed and injected fluids. In one, there was a rectal opening and in the other a penetration about four inches above it, and on the rectal line. I might have considered it deep-seated anorectal fistula if the x-ray had not indicated the involvement of the seminal vessels.

The question of focal infection in the rectum is insufficiently stressed by members of the proctologic specialty in their discussion of proctologic experimentation.

Dr. E. H. Terrell, Richmond, Va.—The possibilities of error in the field of proctology are numerous. A good proctologist does not arrive at conclusions hastily, ever bearing in mind the fact that two or more diseases of these parts often exist simultaneously.

Hemorrhoids are by no means responsible for many of the symptoms attributed to them. In fact, often the associated pathologic condition is of greater importance than the hemorrhoids themselves.

The surgeon may expect only criticism or condemnation when an operation he has performed is not followed by complete relief of symptoms. Improper postoperative care is not infrequently responsible for failure to obtain desirable results. Too often an otherwise excellent surgeon seems to lose all interest after the operation is completed. Open wounds in the region of the rectum usually require more painstaking attention than those in other parts of the body, and the ultimate results, in many instances, are in direct proportion to the care they have received. A successful proctologist always keeps his patients under close observation and following an operation the wounds receive his scrutinizing attention regularly until healing is complete.

CLINICAL CONCLUSIONS ON HIGH SPINAL ANESTHESIA*

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This is an attempt to dispel some of the convictions and prejudices against high spinal anesthesia by clinical observations and experiences. Some of the remarks by necessity apply to spinal anesthesia generally.

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The term high spinal is used in this instance to apply to anesthesia for upper abdominal surgery. Also in very acute lower abdomens we have found that the best results are obtained with anesthesia well above the diaphragm. In lower surgery, where it is desired to explore the upper abdomen, high anesthesia is frequently indicated, for palpation of the upper abdominal viscera without anesthesia is a very shocking procedure.

These are the conclusions from experiences of a combined period of seventeen years. About 75 per cent are private patients and represent a cross section of individuals of a community of 200,000. The risks are, on an average, superior to those of a strictly charitable or teaching institution, and in many instances clinical results seem at variance with frequently written or accepted ideas concerning this controversial procedure.

The selection of high spinal was made because in upper abdominal surgery good relaxation is imperative. Still it is the dividing line which only the minority crosses consistently. Lahey[1] says that in a meeting of a section of this Association only 6 per cent of the group indicated they would consent to high spinal.

One of the two points in literature upon which there seems to be general agreement is, that no other type of anesthesia consistently produces the profound relaxation of spinal. The other is that spinal anesthesia is no safer than the user. It is disregard of the latter fact in practice which has frequently led to prejudice against the anesthetic rather than condemnation of the user. With this potent and rapid agent, and the resultant physiologic changes and requirements which it may be necessary to manage, this is no field for those without thorough knowledge of these factors.

ADAPTATIONS AND INDICATIONS

The most frequent motive for objection to spinal anesthesia is the patient. He visualizes anesthesia as a choice between sleep and wretched wakefulness. With this attitude his remonstrances are justifiable.

Another objection which occurs with the less intelligent patient, most frequently, is that they know some one who was paralyzed by "spinal block". When questioned after operation their knowledge of these paralyzed individuals has vanished.

A routine discussion of the anesthetic will

lead into many unnecessary difficulties and frequently the patient feels that the burden of decision is his. We reserve persuasion only for those who have definitely said that they would not "take a spinal block." In only very rare instances do we meet with continued resistance after sedation, supplementation or the true nature of the procedure is made evident. To be guided by the patient's decision when it is without scientific basis is an injustice to all concerned. Few patients object to spinal anesthesia following the procedure.

A second diminishing factor, as an objection to spinal anesthesia, or perhaps only high spinal, is the surgeon or anesthetist. This may be based upon conviction or what clinically has been proven a too literal interpretation of contraindications. We will elaborate upon these professional objections.

It is a fairly common belief that especially in high spinal the solution may reach the vital centers in the fourth ventricle of the brain, resulting in sudden exodus of the patient. Maxson[2] says that this is not of any practical importance. Weed[3] says that the method of escape of fluid from the fourth ventricle into the subarachnoid space must still be considered as uncertain. Grodinsky and Baker,[4] using the diazo color reaction for procaine, according to Maxson, showed that a membrane prevented the procaine from extending from the subarachnoid space into the fourth ventricle. Dilution to ineffective concentrations by the pool of fluid in the ventricle is another preventing factor according to Maxson.[2]

Total spinal anesthesia has been produced clinically and experimentally since perhaps 1900. Fatal results are probably due to anoxemia or anemia of the vital centers rather than to direct action. This can be controlled under high spinal as long as there is cardiac activity.

A second fear of high spinal is respiratory paralysis. If the anesthetist is aware of this impending complication it can be dealt with uneventfully by intermittent oxygen under gentle pressure. This has occurred in our experience and has never presented a distressing circumstance, even from the patient's viewpoint. There is so little change in the patient's condition and attitude that even the surgeon is usually unaware of this condition.

Permanent neurologic damage is another frequent conviction of those who oppose spinal anesthesia in any form. In our experience this has never occurred, to our knowledge. Lahey[1] says:

> "With 10,000 spinal anesthetics there have been no known persistent complications and this is evidence that technical care and skill in introduction of the needle and anesthetic agent play a very great part in the avoidance of the complications which have been reported in considerable numbers in the hands of others."

Attempting to secure first-hand evidence of these complications, we inquired in the field of neurosurgery. Wilkins and Herman[5] said that their experience had been very limited, which statement in itself was highly significant. There were only two possible cases. One a cauda equina syndrome that had persisted for one month following spinal anesthesia. The other case was studied six months following spinal anesthesia. Continued improvement and objective findings led to a diagnosis of arachnoiditis, possibly due to an allergic reaction to the anesthetic agent. They could report no operative or postmortem experiences. Possible neurologic damage from asphyxia has not condemned sedation or gaseous agents clinically. It has, instead, emphasized the necessity of skill in their administration, and the same should be true of subarachnoid injection.

Increased peristalsis due to spinal anesthesia has been quoted as a contraindication to its use in perforated ulcers. We have observed that spinal is particularly effective in this condition. Babcock[6] said that clinically increased peristalsis does not occur.

Diminished vital capacity due to the loss of lower intercostals can be compensated with oxygen under pressure. Thus the capacity is greater than with the deep plane general anesthesia required in upper abdominal surgery.

Anemic, hypo and hypertensive patients have not developed objectionable complications when managed expectantly. In fact, experiences with hypertensive cases has led us to regard it as a specific indication for spinal anesthesia. It is realized that these are highly comparative terms, as are others used as contraindications, but generally, in our experiences, the patient who is a fair risk for surgery is a lesser risk for high spinal anesthesia. If it is felt that the surgery may be benefited, high spinal is not withheld as a greater risk. We have seen very little surgery of the upper abdomen where spinal anesthesia could not be predicted to be a distinct benefit to the surgical technic.

As to that class of exceptionally poor risk pa-

tients with marked myocardial damage or decompensation, extreme shock and moribund or terminal conditions, nothing but local with light supplementary anesthesia could well be recommended. They are seen very rarely in private surgery and procedures are usually brief.

Our conclusions as to indications essentially parallel those of Graham and Brown,[7] who say:

"Emergency operations have been necessary when we felt it wise to modify our previously determined contraindications and use spinal, and to our delight the patient benefited. As a result of such experiences we have gradually decreased our contraindications. We are gradually being convinced that with adequate collateral support few patients need be denied spinal anesthetic."

SEDATION

It has been mentioned that basically the patient's main objections to spinal anesthesia is that he will be keenly aware of the surgery. Ample sedation usually removes this objection. There is no generalized answer to the problem except that the timid use of sedatives will bring constant dissatisfaction. General alertness, activity, reflexes and size all contribute to the evaluation of the dosage. But any of these must be considerably below average before we decrease our dosage from pentobarbital sodium grains 3, morphine grains ¼ and scopolomine grains 1/200, given in the routine manner. Size is the least reliable factor. With this dosage the patient is rarely over-sedated, but frequently it is too little.

TECHNIC OF HIGH SPINAL

With the many available agents and methods probably none is outstanding in its comparative effects. But the anesthetist who develops complete familiarity with a few technics and solutions makes himself outstandingly effective.

Spinal puncture is usually in the second or third lumbar space, depending upon the comparative length of the patient's back. The needle should be of sufficient caliber to be guided accurately and so that it will not break easily and fluid can be freely aspirated. It is not believed that leakage as influenced by a reasonable sized needle is a factor in spinal headache. The incidence is greater in patients who are ambulatory within a few days than in patients with upper abdominal surgery. Weed[3] has estimated the amount of spinal fluid at an average of 135 c. c. and the formation each day at 525 to 550 c. c. This should discredit leakage as the etiology of headache.

The patient should be held in position by an assistant well trained in the correct procedure. The patient is routinely placed on the left side, if physically possible. By developing one routine, the time and difficulty with spinal punctures can be reduced to a minimum.

High spinal anesthesia should be injected upon the surgical table. It is important that the patient not be moved haphazardly after injection. We have seen four immediate spinal deaths and one barely averted. None was with high spinal and all were poor risks, but three of the deaths and the near catastrophe occurred when the patients were injected, then moved from a cart to the operating table.

Selection of an agent depends upon type of surgery, the deliberation of the surgeon and vigor of the patient. With procaine the dose is 200 mg., depending upon barbotage or Trendelenburg position, or both, for necessary height of anesthesia; with pontocaine 20 mg. and the Sise method. The Wilson technic with nupercaine solution is used effectively in large, vigorous patients. These three and continuous spinal are sufficient for all our upper abdominal anesthesia. As mentioned in regard to sedation, timidity of dosage frequently leads to dissatisfaction. Variation of dosage leads to unexpected results. Variation of the agent to meet changed requirements makes factors more constant and results more predictable.

MANAGEMENT DURING SURGERY

With adequate sedation only a small percentage of patients requires supplementary anesthesia. Routine supplementation increases the possibility of complications. Additional anesthesia is only on definite indications, which are interpreted as uncontrollable mental or physical distress which is detrimental to the patient's condition or the surgical procedure.

Some mildly disoriented patients may be aroused to a point of cooperation and relief. Other distress may be controlled with oxygen. Nitrous oxide, in concentrations of 50 per cent, frequently is effective, but it is never used in higher concentrations to a point of cyanosis. Ethylene or cyclopropane is used as a last resort. Patients with high spinal may be greatly depressed by general anesthesia below the first or second plane.

Theoretically, the higher the anesthesia the greater the drop in blood pressure. Clinically, while the tendency may be greater, it depends

upon how effectively these tendencies are prevented. The term, blood pressure, is misleading and is not the true criterion of the patient's condition. We are clinically concerned with physiologic function of vital factors and blood pressure may only terminally portray dysfunction. Such symptoms as pulse rate and pressure, condition and color of skin and mucous membranes, volume and rate of respiration and capillary fillings must all be evaluated. Low blood pressure itself may occasionally be insignificant.

"Neo-synephrine" is used routinely and is perhaps more effective when given above the zone of anesthesia. It should be used with caution in hypertensive cases, as they may show a tremendous response of short duration. The same is true with young adults. Repeated use of hypertensive drugs diminishes the duration of the anesthesia and may rapidly terminate its effect if given in the latter third of its expectancy. We depend largely upon fluid, plasma or blood, as indicated after the initial injection, especially if the time element is involved. A gallbladder rest should be used only when, or while, necessary, as they can be very depressing to vital functions. The same is true of sustained traction in the upper abdomen.[8] Large abdominal tumors, free fluid, distention or obesity may also give respiratory embarrassment, especially in the Trendelenburg position.

We have seen more temporary nerve changes caused by position or pressure during surgery than by spinal anesthesia.

Some of the patient's complaints are not necessarily cause for alarm or supplementation. They may complain bitterly of hot packs, weight or pressure on the upper chest, due to the zone of hyperesthesia. This zone is frequently described with apprehension as "pain in the heart." Loss of sensation of respiratory movements may cause the complaint that "they cannot breathe." Resourceful management of apprehensive conditions will greatly reduce the need of supplementation.

THE CLINICAL EVALUATION OF HIGH SPINAL

With the consistent outstanding relaxation and the quiet approachable state of the abdominal viscera obtained with spinal anesthesia, it should reach its greatest efficiency in upper abdominal surgery. The technical skill of the surgeon is best under these conditions. Surgical shock is minimized and procedures are less deliberate and more complete when these influences exist. Postoperative embolism, respiratory infections, obstructions, leakage and generalized peritonitis by extension should occur less frequently with this optimum of surgical conditions.

Graham and Brown,[7] in discussing spinal anesthesia from their viewpoint, have said:

"Lesions questionably operable with inhalation anesthesia can often be dealt with effectively, particularly high lying gastric ulcer or gastric cancer."

They also stated that because of the ease and safety of exposure of the common bile duct with spinal they explored the common bile duct in 46.9 per cent in a reported series of over 300 cases. In those with calculus and cholecystitis, they removed stones from the common duct in 21.4 per cent. They remark:

"This is at variance with our experience in biliary surgery under inhalation anesthesia when, because of technical difficulties, largely inadequate exposure, exploration of the common duct added greatly to the mortality, hence was not undertaken unless the stone was obvious."

Some of this latter group were probably candidates for further surgery and insufficient anesthesia was largely the contributing factor.

What is the hazard of the high spinal even though surgery is benefited? Where successful surgery is dependent upon adequate anesthesia, the isolated statistics of the anesthetic are insufficient. But in our own experience there has been no immediate high spinal death. In a critical analysis[7] of 202 surgical deaths, in which spinal was always the anesthetic, it "might have contributed to 5." Veal and Van Werden[9] reported thirty immediate deaths in over 30,000 cases with all types of spinal anesthesia. To those familiar with the procedures, it should be evident that the mortality of high spinal anesthesia is insignificant compared with that of upper abdominal surgery. It offers conditions favorable for a reduction in the surgical mortality which far over compensates its hazard as an anesthetic.

Graham and Brown,[7] in reviewing several thousand cases under spinal anesthesia in which were included serious and advanced malignancies, acute obstructions and palliative resections in malignancies, concluded:

"It impresses us that spinal anesthesia has in no small degree contributed to the low operative mortality."

Lahey[1] says:

"I am definitely convinced that it (spinal anesthesia) has certainly in our hands distinctly accomplished a definite lowering of the mortality rate."

We know that the surgeons with whom we are closely associated believe in this combined safety factor, that is, upper abdominal surgery under high spinal anesthesia. They not only insist upon it for their patients, but also for themselves and their relatives. We have been clinically convinced of its value and safety, and we use it as the anesthetic of choice for upper abdominal surgery.

There is a type of anesthesia seldom mentioned, but of which we are all aware. There are no statistics available, but it undoubtedly contributes frequently to operative sequelae and mortality. It is particularly contraindicated in upper abdominal surgery. Its effects may extend to a successive surgical procedure. It is inadequate anesthesia. In the hands of the competent anesthetist, high spinal is seldom its associate.

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DISCUSSION (*Abstract*)

Dr. J. T. Flynn, St. Louis, Mo.—The reason, of course, for spinal anesthesia is the relaxation that is achieved, and it is unsurpassed by any other anesthetic. The objection that I have encountered chiefly is from the patients, that they are awake.

The fatal results which occur from spinal anesthesia are definite, but they apparently are not very numerous. I have not seen any so far.

In analyzing the cause of the spinal anesthesia deaths, I believe they occur too suddenly to be due to anoxemia or anemia. It takes a certain length of time to produce death from either of those causes.

The most probable cause is the heart.

Another possible complication is the injury to the nerves. When we do a spinal puncture, injury to the nerve is always at least a possibility. I have heard of cases of permanent foot drop following a spinal. That, again, is second-hand.

When I have a patient under a spinal, I usually encourage him to forced respirations occasionally, about every minute or so. This seems to eliminate much of the need of supplying oxygen, and it also seems to keep the patient somewhat occupied so that he does not mind the procedure quite so much.

I am very glad to hear Dr. Wolff bring out the wide range of availability of spinals. Hypertension and hypotension are not contraindications. I have been rather on the conservative side and have hesitated probably many times when a spinal would have been the anesthetic of choice.

In giving sedation I always include atropine with pentobarbital solution. It possibly has a protective action on the heart. In addition, if an inhalation anesthetic is required it eliminates some of the saliva that would interfere.

Some years ago I was in an institution that did spinals upon ambulatory patients. They walked in and got their spinals and walked out. Thousands of patients were treated that way over a period of years. As far as I know, there were no undesirable results, and they did not seem to have many headaches. Occasionally, some one would faint, but this did not occur any oftener than it did with a Wassermann, for example. In taking blood an occasional person faints.

Dr. Wolff brings out an important point in his mention of fatal results, that is, not to move the patient. That would indicate to me that it is the anesthetic rather than the spinal puncture that causes death.

I often wonder whether we ever really know how high the anesthetic will go. I do not believe it is possible to determine that consistently or definitely because of the difference in size of the arachnoid space. The volume of fluid in a small arachnoid space naturally is going to be higher than in the larger space.

Everyone gets excited when there is a drop in blood pressure. It is only one of the factors, and if the general condition of the patient is good, it should not be a cause of alarm.

I have encountered some difficulty from traction or pressure against the diaphragm and heart. It is disturbing to me, at least, and to the anesthetist.

Dr. Francis G. Speidel, Washington, D. C.—Dr. Flynn asked the question, "Do we know how high the anesthesia has gone?"

Any of you who are familiar with spinal anesthesia have noticed, perhaps, that the anesthesia for a high or upper abdominal operation will stop or seem to stop at the nipple or slightly above. The upper portion of the integument of the breast has a dual nerve supply; in addition to the usual segmental innervation there is another from the superficial branches of the cervical plexus, so that the stoppage at the nipple is apparent rather than real. This may be determined by examining the cutaneous area supplied by the intercostobrachial nerve, a triangular area on the inner aspect of the upper arm. If this is anesthetized it indicates that all of the thoracic posterior roots are involved, including the first. Any further upward extension will be indicated by the rest of the skin of the arm's becoming anesthetized, while the anesthetic level at the nipple remains stationary. In fact, should the upper breast become involved, it is well to see whether the lobe of the ear and parts of the scalp are involved, as these areas are within the same distribution, that of the cervical plexus.

If all of the autonomic nerves of the thoracic segments are involved, there must of necessity be a general paralysis of the vasomotor mechanism, since there are no white rami above the first thoracic, as was pointed out by Gaskell many years ago. So that, neurologically

speaking, a blood vessel of the scalp is at the level of the shoulder. It is sometimes assumed that the anterior roots are immune to procaine if at a high level. This may be true of the nerves of the skeletal system, but if a section is made through a thoracic anterior root, the skeletal nerves appear dense and about 10 or 12 microns in diameter, while the autonomic nerves are of a fine and delicate structure, and only about 2 or 3 microns in diameter. They look as though they might be quite susceptible to the action of an anesthetic agent. I do not know that this is the case, but the advocates of high spinal anesthesia are of necessity on the defensive, so to speak, and it is up to them to show that there is not a general vasomotor paralysis. Furthermore, as shown experimentally by Burch and Harrison ("Effects of Spinal Anesthesia on Arterial Tone," *Archives of Surgery*, 22:1040, June, 1931) in dogs the vasodilatation usually included the unanesthetized areas as well as the anesthetized areas. In other words, the thoracic outflow is blocked so that the vascular paralysis is general. This is not the explanation given by the experimentors, whose findings were unexpected. However, in general a "surprise" finding is of greater value and entitled to more credibility than an expected result.

The above leads to the question of the value of the sympathomimetic drugs such as epinephrine and others of that group. The sympathetic nerves at their terminations are believed to secrete a substance which is either epinephrine or cannot be distinguished therefrom by chemical methods. Hence, though the nerves are blocked at their exit from the spinal cord, if the epinephrine is supplied vicariously the typical sympathetic action will occur anyway. Therefore, the action of epinephrine is always the reverse of the action of spinal anesthesia, and if the action of the epinephrine group is known, the action under spinal anesthesia may be predicted, and vice versa. Historically, Elliott and others identified the sympathetic structures by noting those organs which responded to epinephrine, while Dale and others showed that the parasympathetic structures responded to acetylcholine, even before acetyl-choline was demonstrated by Loewi to be liberated at the vagus terminals. Of course most organs have a dual innervation if innervated by the autonomic system, and the two act in opposite directions.

The adrenaline responses and the responses of the same structures under spinal anesthesia are usually opposite.

The defense mechanism, as expounded by Cannon, is, under spinal anesthesia, likely to be operating in reverse; and this occurs at a time of stress, with intensified effects due to hemorrhage and shock, if these occur.

If you wish to be thoroughly disliked quickly, merely say, before a spinal anesthesia enthusiast, that the administration of a spinal anesthetic is practically the same as giving the patient a large single dose of a powerful autonomic poison, without knowing the tolerance of the patient.

Years ago Elliott injected epinephrine intravenously and noted the following reciprocal action: while the smooth muscular layer of the intestine relaxed with decrease in peristalsis, the circular band of smooth muscle we call the ileocecal valve (but which, as Elliott showed, is really a sphincter) underwent constriction. Thus we have simultaneously constriction and relaxation. Under spinal anesthesia we have the same but in reverse, that is, as the sphincter muscle relaxes hyperperistalsis develops. Also hyperperistalsis is associated with blood pressure in an inverse proportion, and this is true with the elevation of the blood pressure due to the administration of a sympathomimetic drug. As the blood pressure is restored the peristaltic action lessens.

Thus we have at least three methods for the production of "cholinergic shock:" spinal anesthesia, administration of an autonomic poison of the physostigmin group, and division of the cord in the cervical region. A possible fourth, for which the anesthetist should be alert, occurs under cyclopropane anesthesia: any increase in peristalsis with evidence of vascular depression, especially if accompanied by slowing of the pulse rate, should, I believe, be considered as belonging in this category.

Dr. Hayward S. Phillips, Atlanta, Ga.—We all agree that spinal anesthesia is good. Most of the criticism that comes is not because of the anesthetic itself, but because of the administrator.

A good surgeon cannot be a good anesthetist and neither can a good anesthetist be a good surgeon. Both jobs cannot be done at the same time.

It is the custom of many surgeons to give their own spinals. When we hear criticism of anesthesia, that is where the trouble is. They relegate the care of the patient after the spinal has been administered to some one who is incompetent to look after him. How do they know how high the spinal was after they started the surgical procedure? They have no way of checking that in the world, unless respiration ceases and they assume the anesthetic has gone too high. If the respiratory system is affected and the patient has an anoxemia, they have no means of knowing it unless he becomes cyanotic, and if he does, it has gone too far already.

The psychic element in spinal anesthesia is a very great factor.

It seems to me that some form of combination anesthesia is indicated; I do not care whether it is inhalation anesthesia or intravenous. I am more partial to intravenous. It can easily be controlled, it can be given when necessary, and it has value in counteracting many of the side actions of spinal anesthesia.

How many times have you seen a patient lying on the table without anybody watching him at all, lying there cold and clammy and sweaty, and in some cases he may have been nauseated and vomiting. Not all patients who have spinals have these reactions, but many do. If you will give these patients an intravenous anesthetic, just enough to keep them asleep or allay the psychic reactions, you will not have undesirable reactions. The patient will come off the table in good condition, and if during that time the patient needs oxygen, you can give it. The patient will then come off the table after a spinal anesthetic in as good condition as with any type of anesthetic that you could possibly give.

Dr. Wolff (closing).—We merely mentioned continuous spinal, because it is discussed in two other papers in this Section. We feel that it has a very definite place in anesthesia. Eventually it may be perfectly controllable, both as to slow induction by starting with a weak solution and gradually increasing the concentration to a point of adequate anesthesia. There is also the possibility that some neutralizing agent may be developed which could be introduced with the continuous spinal method, which would terminate the effect of spinal anesthesia rather promptly.

The objection is that it is a little more cumbersome. It takes trained assistants to turn the patient and keep him in the right position, but in long drawn out cases it is very valuable.

Dr. Flynn mentioned the fact that the action of the drug on the heart was the probable cause of death. We agree that all immediate deaths are probably cardiac. There should be no other reason.

He also mentioned the fact that information was second-hand in regard to nerve changes from spinal anesthesia. We have found that such information from the laity is of absolutely no value.

We mentioned hypertension as an indication for spinal anesthesia. That is because the hypertensive patient is frequently the type most difficult to handle under general anesthesia. They are frequently the obese, short-necked, barrel-chested, plethoric type. There is often respiratory obstruction. The blood pressure usually increases, whereas with spinal it is diminished in some cases as much as 100 points. However, these same patients with bed rest may show a maintenance blood pressure far below what they carry when up and around.

We mentioned the moving of the patient as a dangerous procedure. Possibly the patient can be moved if it is done correctly, but in all the instances that I mentioned the patients were moved in a flexed position by one or two people, and they were holding on tightly with their arms.

It is possible that with the patient in this position and straining with upper extremities, acute cardiac failure might occur, because blood is forced largely into the lower anesthetized portion of the body where there is neither muscle nor vascular tone.

For the surgeon to give his own spinal anesthetic is not to the best interests of the patient or the surgeon. It is the very thing that has led to much condemnation of spinal anesthesia.

Intravenous anesthesia with spinal is very satisfactory. We do not use it often because it is a little more cumbersome. It may require two persons' time and since the patient may need oxygen, we simply do the whole thing with the gas machine. Thus we can supplement and give oxygen, too.

AN EVALUATION OF THE AUDIOMETER IN TESTING HEARING*

By C. C. SWANN, M.D.
Asheville, North Carolina

Since the advent of the audiometer we are able to determine to a much more accurate degree the correct diagnosis and scientific treatment of hearing defects. Types of deafness differ fundamentally from one another, and their differential diagnosis depends to a great degree upon a careful application of functional hearing tests. An accepted universal method of testing is most desirable and the audiometer is invaluable in that it enables us accurately to plot a curve of the quantitative loss of hearing for different frequencies. Thus we are able to check the variations in hearing while treatment is being carried out and determine accurately the effectiveness of therapy. Patients whom I have treated and to whom I have given various drugs have been positive that improvement resulted, when repeated audiograms showed conclusively that the only benefit derived was psychic in their particular case.

Formerly my auditory tests consisted of examination by the watch-tick, Galton whistle, spoken and whispered voice and tuning forks. Watches differ considerably in the loudness of the tick, depending upon the make. Naturally, watches in the hands of different examiners give different results, as some can be heard several feet away and others a matter of inches. For practical purposes spoken voice tests are essential, as they give the state of hearing for mixed sounds, whereas the tuning forks and audiometer give responses only to relatively pure tones. However, much depends upon the clearness of enunciation or articulation and upon the use of emphasis, as pointed out by Wells.[1] He further says that spoken words differ from one another in their pitch quality, which is an important item in audibility. All numerals, for example, except six and seven, have a low range of frequency; consonants generally are higher than vowels. The best hearing for articulate sounds is normally attained at an intensity of about 50 to 60 decibels above threshold; this is the usual intensity of ordinary speech at the distance of about 4 feet. The range of the spoken voice is about from 250 to 3,000 double vibrations; whispered voice from 3,000 to 6,000 double vibrations, and the Galton whistle from 6,000 to 25,000 double vibrations. People with nerve deafness who have quite marked losses in hearing for distant or faint sounds hear nearby conversation quite well. The spoken voice remains the final positive test in the application of a hearing aid.

The tuning forks are invaluable for testing for low tones, below 128 double vibrations, and also for comparison of air and bone conduction. They are especially valuable in estimating the condition of the conductive apparatus. The method of tuning fork testing is generally handled differently by each otologist. Various methods are used to activate the fork, and one examiner will create a greater intensity of tone

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for a longer period of time than another. The careless use and interpretation of tuning forks can be appreciated when we examine a totally deaf child and find it responding to a fork on the forehead. Despite the many real objections to tuning forks, their use remains a valuable adjunct to present day methods of testing.

The audiometer produces relatively pure tones by means of electrical energy and the frequency, as well as the intensity of these tones, can be raised or lowered as the examiner desires. The frequency and intensity levels are indicated on dials of the instrument and charts are recorded of the findings obtained. In audiometric studies, the sensitivity of the ear is measured and on the chart a straight line represents the threshold of audibility for normal hearing. Any loss is noted as falling below the normal threshold and is expressed in decibel units. The decibel represents the ability to tell the difference between two tones at the same pitch and indicates the smallest change in intensity that the human ear can detect. Since there are 120 decibel units or steps of intensity which the ear can detect from a threshold of audibility, percentage losses can be determined as eight-tenths of the decibel loss indicated on the chart.

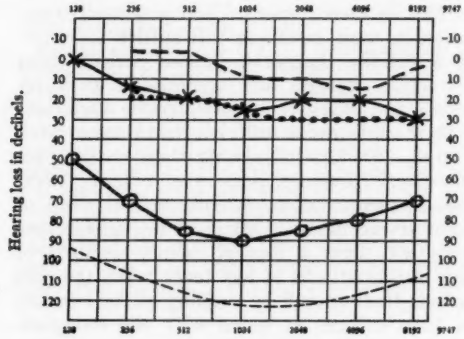
In legal proceedings it is valuable to be in a position to estimate fairly accurately the percentage of hearing loss in a particular case. Audiometric studies are especially important in testifying in those cases where hearing is impaired in one ear, as by masking out the good ear we can arrive at the correct amount of damage to either the conductive or perceptive apparatus. When deafness amounts to more than 80 decibels, masking should be done with the Barany buzzer. The prognosis in these cases must necessarily be made from judgment and experience, but a correct estimation of loss after testing for both air and bone conduction is of considerable help in giving a final opinion as to the amount of disability. Patients with poor bone conduction usually incur a greater disability due to the likelihood of less benefit to be derived from a hearing aid. In examining draftees for military service, use of the instrument is an easy and quick method to detect malingering.

It must be emphasized that one audiometric test is inconclusive and that the examination should be repeated on successive days or at intervals convenient to the examiner. For most cases at least three examinations should be done and variations of as much as ten to fifteen decibels may be found. The tests should be done at approximately the same time of day on repeated examinations; otherwise appreciable differences will be found, as hearing in some individuals is constantly more acute in the morning hours. Patients with nerve deafness are fairly constant in their responses and a second examination in most instances will suffice to establish a definite diagnosis. Those patients with obstructive deafness are indefinite in their responses and many times considerable variations in their audiograms will be found from week to week. Factors influencing these changes are atmospheric pressure, periods of extreme nervousness, menstruation, fatigue, loss of sleep or recent severe illness. Many of my allergic patients will show a loss of twenty decibels or more during attacks of hay fever, when the only otologic findings will be swelling of the eustachian tube orifices as noted with the nasopharyngoscope.

An absolutely sound proof examining room in our office is not practical for most of us. The room should be sound-damped and as much extraneous noise as possible excluded. What we are mainly concerned with is to secure records for comparison from time to time. It is more important to have the undivided attention of an intelligent patient than to have a sound-proofed room. If any considerable divergence occurs in audiograms of patients previously tested, we should immediately suspect fault in our audiometer. My instrument is tuned before starting the test on a patient and it is wise to check the audiometer at frequent intervals. This is done by comparing a 512 tuning fork to the receiver with the instrument set at 512; the two tones should be together. There are many of us who have purchased at least two audiometers and now wonder if we have the best equipment available. I believe that the value of the instrument lies not so much in the make as in frequent inspections and necessary calibrations by the concern producing it.

It has been my experience to find excellent hearing in many children referred for defective hearing by school nurses or technicians after mass hearing tests conducted with the phonograph audiometers. Kinney[2] estimated that 20 per cent of the school children who do not obtain a normal rating in this test have no fundamental hearing loss. It is hard to explain to a disturbed mother that low intelligence or inattention accounts for the findings reported, as most of them remember occasions when they were

convinced their child did not hear well. When there is a small loss for low tones in children, the test should be repeated in as quiet a room as can be secured. Outside noises interfere very little with high tone perception. It is by use of the pure tone audiometer, tuning forks and spoken voice combined with an otological examination that we complete the study begun by



Key

Air conduction: Right by joined o, left by joined x.
Bone conduction: Right by joined ●, left by joined –.

Fig. 1

Miss M. G., aged 18, student. Obstructive deafness. History of repeated middle ear infections on the right since infancy; deafness is beginning in the left ear and mother was nearly totally deaf after middle life. Examination revealed right drum absent; left drum intact, retracted and calcareous deposits present. Left middle ear inflated with difficulty. Large remnants of tonsil and adenoid present, with adhesions about eustachian tube orifices. Tonsillectomy and adenoidectomy were performed and adhesions broken up.

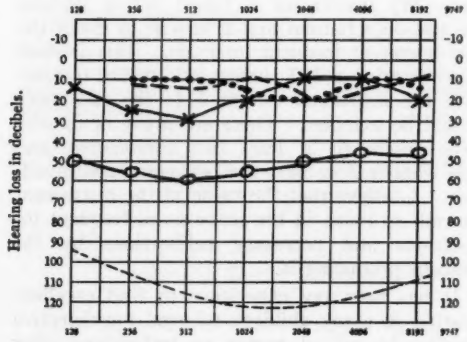


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Fig. 2

Miss M. G. (continued): Patient returned at intervals of a month or six weeks for inflation and passage of bougies on the left eustachian tube. Hearing improved 10 decibels for air conduction above 2048 d.v. in the left ear and approximately 25 decibels for air conduction in the right ear. Advised to come in every three months for observation and hearing tests.

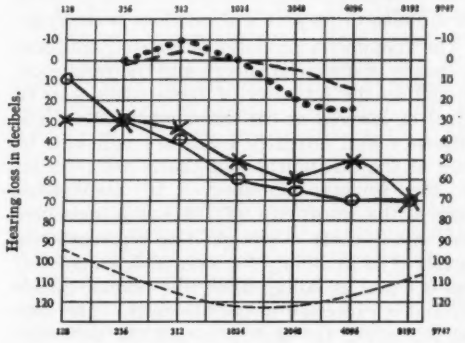

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Fig. 3

Miss R. C., aged 20, unemployed. Middle ear deafness. History of deafness since childhood and left ear has drained at intervals since infancy. Tonsils absent, nasal septum deviated to right and very poor aeration in right nares. Right drum intact, thick and retracted; large perforation in left drum and moderate purulent, fetid exudate present. Advised daily drying with cotton applicators and application of iodine powder daily at home.

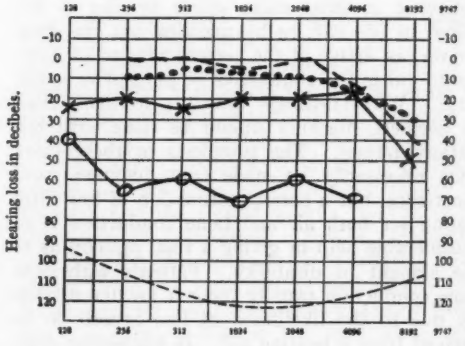

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Fig. 4

Miss R. C. (continued): Returned in 30 days with left ear entirely dry and hearing improved 30 plus decibels in this ear. Further history revealed that Dr. Jervey, of Greenville, had used similar treatment in spring of 1941 and had her stop aural irrigations used all her life. Treatment had been discontinued for several months due to change of residence. Endeavor to inflate right middle ear unsuccessful due to deviated septum. Submucus resection now advised.

group testing. The phonograph audiometer is a most useful instrument for the rapid detection of children whose hearing should be further investigated. Parents should be advised by the school that a possible defect is present, but that an otologist should be consulted before a definite diagnosis can be made. Since mass screening was instituted in public schools greater progress has been made in the solution of numerous teaching problems. Children who had been

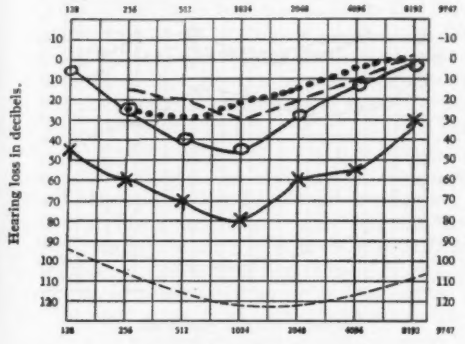

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Fig. 5

Miss A. L., aged 19, student. Otosclerosis. Hearing very poor in the left ear since 14 years of age and deafness is beginning in the right ear; tinnitus and vertigo for the past several months. Drums slightly retracted, otherwise normal; eustachian tubes patent; nose sinuses and pharynx negative. B.M.R. plus 8, general health excellent.

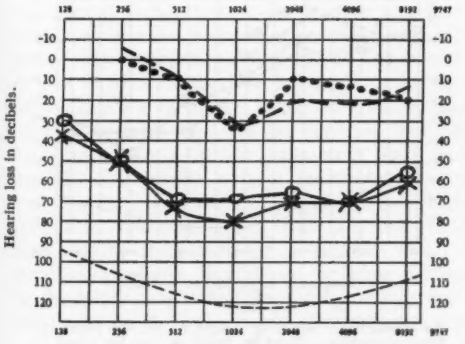

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Fig. 6

Miss L. L., aged 47, bookkeeper. Otosclerosis. Typmpanic membranes slightly retracted, tubes patent; pharynx, nose and sinuses negative. Tinnitus and vertigo are relieved by prostigmine methylsulfate 1:2,000 and patient firmly insists that hearing improves following injections. Repeated audiograms reveal no improvement in hearing.

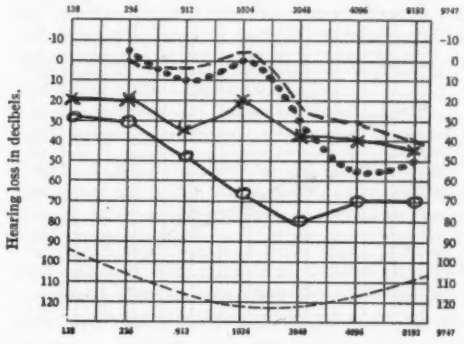

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Fig. 7

Mr. G. R., aged 29, carpenter. Combined deafness. This patient was previously in the Navy and was refused readmission due to deafness. No history of deafness in family; hearing is much worse during attacks of tonsillitis. Drums intact, grey and thick; middle ears inflated with much difficulty; tonsils diseased, large and embedded. Tonsillectomy in 1934, followed by repeated inflations and bouging, without benefit. Audiogram reveals a loss of everything except bone conduction for low tones. Must consider traumatic occupational deafness.

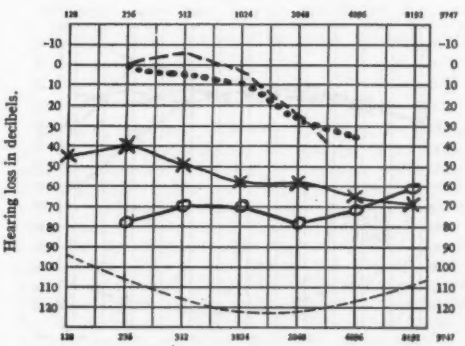

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Fig. 8

Mr. R. L., aged 57, retired naval officer. Obstructive deafness. Nose, throat and ears especially negative; eustachian tubes patent. This man had marked difficulty with both an air and bone conduction carbon amplifier type hearing aid. He was given a vacuum tube air conduction set and obtained excellent hearing.

listless and deficient in their work were found to have acoustic loss and this loss a direct relation to certain types of behavior. It is thus possible to give extra attention to an individual child or segregate these children for special instruction. The majority of children with deficient hearing have a middle ear involvement and it is important to remember that in the early stages, air conduction is more impaired for high

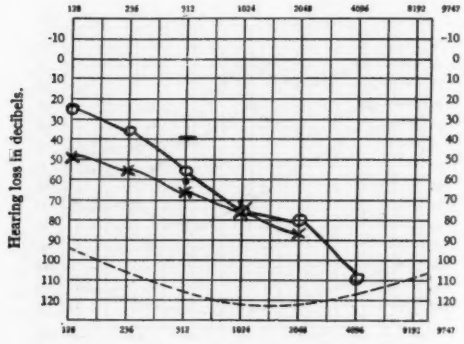

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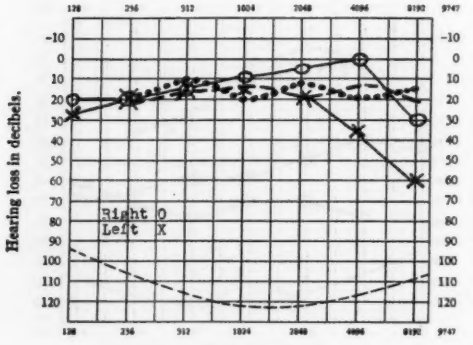
Fig. 9

Mr. Van V., aged 51, electrician. Combined obstructive and nerve deafness. History of deafness for 20 years. Examination revealed a markedly deviated nasal septum and a bilateral chronic ethmoiditis; ear drums intact, thick and retracted. Unable to pass the smallest eustachian catheter on either side. Submucus resection in 1935 and complete stenosis discovered in both tubes; never able to inflate either middle ear. No improvement from any treatment. Note that b-c comes through only at frequency of 512. Dr. C. C. Bunch uses only this frequency in testing for bone conduction.



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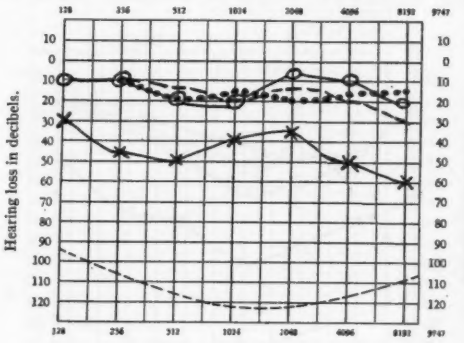
Bone conduction: Right by joined ●, left by joined –.

Fig. 10

Mr. A. A. M., aged 56, minister. Meniere's disease. History of tinnitus and deafness in the left ear, associated with vertigo. Pharynx, nose and sinuses negative; ear drums intact, normal to appearance and each middle ear easily inflated. Audiogram is not significant.



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Bone conduction: Right by joined ●, left by joined –.

Fig. 11

Mr. A. A. M. (continued): The attacks of vertigo are more severe and are accompanied by nausea. Tinnitus is more marked and the audiogram reveals a considerable loss for air conduction in the left ear.

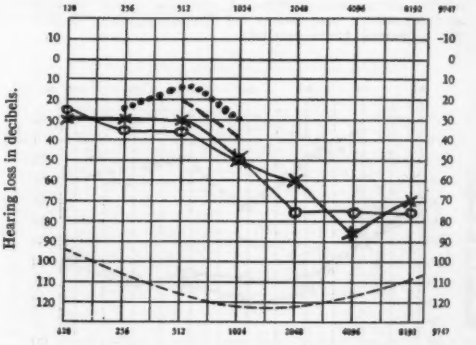

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Fig. 12

Mr. R. B., aged 35, manufacturer. Progressive nerve deafness. History of tinnitus and deafness since automobile accident in 1934. No previous ear infections and no deafness until five years ago. Tonsils absent, sinuses negative, drums very thick, retracted and middle ears inflated with difficulty. Since purely obstructive deafness rarely exceeds 50 decibels, a complete examination by an internist was requested. A 4 plus Wassermann and positive spinal fluid was discovered. Deafness has gradually increased despite intensive local and antiluetic treatment, including tryparsamide.

than for low tones, as remarked by Crowe.[6] A possible exception is otosclerosis, and in most patients beyond childhood with obstructive deafness we find diminished air conduction which is more marked in the lower tones, bone conduction being about normal. Nerve deafness usually is revealed in an audiogram by a loss in air conduction which is greater in the higher frequencies and an accompanying loss of bone conduction throughout. In nerve deafness, unaccompanied by changes in the cochlear windows, the bone conduction loss is about the same or less than air conduction loss. Combined deafness is usually revealed in a graph showing good bone conduction in the lower tones, with a loss of all else; there is a loss of air conduction in both the lower and high tones and the bone conduction loss in the higher tones is usually less than the air conduction loss here. Purely obstructive lesions rarely cause a loss above 50 decibels and when it exceeds this amount nerve deafness or window changes should be suspected. Many variations from the usual audiogram have been illustrated and their possible cause explained in detail by Altmann.[4] In view of this there should be greater hesitancy in depending too much upon the audiogram in making a diagnosis.

Many partially deaf people come to us simply to find out if they can be helped by a hearing aid. For specific reasons they may not wish to purchase or wear a hearing device, but it will be a great comfort to know that in the future they can rely on help from such an aid. Our advice must naturally depend upon the vocation of the individual and the demands to be made on his hearing faculty. Taken as a whole, audiometric examinations are far superior to tuning forks and speech tests in examining for a hearing aid. A person with a nerve deafness remaining less than 40 decibels may be advised that conversational tones will continue to be heard quite well, whereas a patient with obstructive deafness should not be thus advised. In the latter case, when the audiogram reveals a loss of 35 to 40 decibels, we may expect a considerable improvement from an aid, especially for faint or poorly articulated sounds. In either type of deafness where the audiogram reveals a loss between 40 and 60 decibels, a hearing aid or lip-reading instruction is definitely indicated. Caution should be used when advising that help may be expected by persons of advanced age with nerve deafness, though surprising results can be secured in some of these individuals by use of an air conduction vacuum tube set. It is never wise to advise a patient from the audiogram as to whether they should wear an air-conduction or a bone-conduction appliance. Many patients with obstructive deafness will secure the same or greater benefit from an air-conduction apparatus; when air conduction loss does not exceed 50 decibels a vacuum tube air conduction set should be tried.

In conclusion, I wish to emphasize that a functional examination of hearing is far from complete when an audiogram only is made by the physician or his office nurse. The audiogram should be considered similar to an x-ray, as only one aid in arriving at a diagnosis. The audiogram is the most practical method by which a patient may be watched by different otologists. A satisfactory audiogram may be made on many patients who are unable to cooperate sufficiently for other tests and this is especially true in children. The audiometer is the best method for testing the higher tones and defects here call for a careful otological and many times a complete general examination by an internist. An audiometric study should be made on every patient who complains of defective hearing.

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DISCUSSION (*Abstract*)

Dr. E. J. Chapman, Asheville, N. C.—In the audiometer, we have an instrument that enables us to measure with mathematical exactness the energies which are in known relation with the sensation of hearing. It is a distinct advantage over the older methods previously used, which at best were haphazard and unreliable. It is by far the most valuable single method at our disposal today, but, as Dr. Swann has already said, it must be interpreted along with other findings before a definite diagnosis can be made. Crowe has emphasized that a differential diagnosis of the various types of deafness cannot be made with the audiometer alone. To be of any value an audiometer test must always be supplemented with the tuning fork tests. He has pointed out the necessity of taking a detailed history, examining the upper air passages, the tympanitic membranes and the eustachian tubes and the use of masking when making the hearing tests. Jones and Knudsen and others have also pointed out the values of the vestibular tests in certain types of nerve involvements, where the vestibular portion of the eighth nerve may be involved.

There is a use of the audiometer which Dr. Swann has not mentioned and that is testing the hearing in patients

wearing various types of hearing aids. Hayden says it can be used by passing the audiometer's calibrated tones from the ear piece, or head phone, into the transmitter of the hearing aid and recording the results in an audiogram which is measured in decibels. An evaluation of the tone characteristics as well as hearing acuity is obtained which is of prime importance in selecting a hearing aid. With this method of testing, it is possible to register and compare the efficiency of both air and bone conduction types of receivers, and it is a help in choosing between the carbon and vacuum tubes types of hearing aids put out by the different commercial companies.

Dr. Millen A. Nickle, Clearwater, Fla.—In using an audiometer one should first be certain that it is one of the standard accepted pure-tone types, on which an occasional check is made to be sure it is properly calibrated. With such an instrument, one can better serve the interests of his defective hearing patients, than by the more time-consuming, and less accurate former methods of testing. Graphic records can be quickly made, and their value in keeping a watch on the progress of each case is, of course, obvious. These graphs may be checked by tuning forks or by other tests when deemed necessary.

Experiments seem to indicate that binaural testing both with the audiometer, by means of two ear pieces connected to the same instrument, and, by the spoken voice, has a distinct advantage over single ear testing. This may be due to a coordination of impressions when made on the cortical centers of both sides at the same time. Further research along this line will be followed with interest.

However, as Dr. Swann has pointed out, the audiometer should be considered as a valuable aid, rather than a conclusive test. In the final analysis, how well he can hear the spoken voice, is what interests the patient most.

In many states audiometers are being used in the schools. In some it is a legal requirement that all children in schools have annual hearing tests by means of the audiometer. If even a small percentage of the estimated three million children in the United States who have subnormal hearing can be benefited thereby, a major contribution to the cause of preventive medicine will have been made.

Thus will very many more cases of otherwise undetected hearing defects be brought earlier to the attention of the otologist for further examination and treatment, than would otherwise be the case. Since perhaps most of these are due to removable causes or are amenable to treatment, the benefit of bringing them earlier under treatment can scarcely be overestimated. It would be comparable to the use of the Mantoux test and the x-ray in the early detection of tuberculosis.

It is true, many of these handicapping conditions had their beginning before the child was old enough to attend school. But, if they know that tests with the audiometer are being made in the schools, parents are apt to become more and more hearing conscious about the younger children and be led to keep a closer watch for signs of trouble during the preschool age.

The audiometer is very generally used in both the Army and the Navy, and it has been very valuable in detecting cases of malingering. In England it is used regularly in the Royal Air Force.

SUBLUXATION OF THE HEAD OF THE RADIUS*

A PEDIATRIC CONDITION

By SAMUEL A. ANDERSON, JR.
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You may wonder why a pediatrician has chosen to present what may rightly be considered an orthopedic subject, and what may be a commonplace problem to the orthopedist. My reasons are that in the first place the condition is limited to children and usually very young children when they are most likely to be still under the care of the child specialist and to be taken to him first. In the second place, by referral and by conversation I have found that the orthopedist and surgeon are, for some reason, not very familiar with it and are therefore inclined to incur unnecessary expense and trouble in its diagnosis and treatment. I have also failed to find it mentioned in pediatric texts and in at least one system which discusses other surgical conditions especially incident to childhood. No claim is made for originality in this presentation. It was most interestingly and exhaustively treated more than fifty years ago by Van Arsdale in Volume IX of the *Annals of Surgery*. He gives Fournier credit for first describing it accurately in 1671.

On May 1, 1935, the writer was called to see David T., a little boy aged 2 years, whose mother said something was wrong with the right arm. The story was that she had helped him quickly on to the curb by that arm and that he had cried with pain. Since that time, an hour or two before, he had held it by his side, refusing to use it and crying when it was moved by anyone else.

When first seen the child did not appear to be sick or to be in any discomfort. He was sitting quietly on his mother's lap, but there were stains of recent tears on the face. The right arm was held by the side, slightly flexed at the elbow and in about mid-position between pronation and supination. All attempts to elicit voluntary movements failed. Both complete flexion and complete extension of the elbow caused crying. Pronation caused some discomfort. Attempts at supination caused violent pain and beyond the mid-position there was a distinct resistance to the motion as if something had become wedged between the bones.

The memory of a clinical demonstration by Dr. J. M. T. Finney to our fourth-year class in surgery came to mind. In this he showed a condition frequently seen in young children following sudden pulling of the extended elbow which can be quickly corrected with the proper maneuver, but there, alas, at the important

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point, memory failed me, and it became obvious that my attempts at reduction were doing more harm than good.

Since I believed the condition must be one frequently encountered by surgeons, the child was sent to a near-by clinic to a very competent man, while I went back to the office to refresh my faulty memory. I was not present, but Dr. X told me that in the course of his examination, manipulating the forearm in various directions, he felt a slight click at the elbow. He frankly stated that he did not recognize the condition and told the mother to take the child upstairs for an x-ray. On the way to that department she noticed that the child was using the arm normally again, so instead of having the film made she went on home and called me to ask if the expense of the x-ray really must be incurred now that the arm seemed well again. I assured her that it need not be and explained that Dr. X had happened on to the proper manipulation which I had forgotten.

With the exception of being sent to the surgeon this is the typical history of subluxation of the head of the radius. The trauma may come from almost any quick-pulling motion. The writer can remember incidents of pulling a sweater over the child's head; picking up the child by one arm after a fall; one child pulling a wagon away from another; pulling a child from under the table by one arm. All are instances of suddenly pulling the outstretched arm. A little boy with a congenital heart and rather poor musculature has had three or more recurrences.

On one occasion this child's mother called me when I was at the hospital and said that the arm was out of place again and asked me if I would treat it right away. I told her to come on down to the hospital. When she arrived I took an intern with me to show him what I thought would be an interesting demonstration. After considerable effort, however, I was unable to feel the click or to bring about relief. The mother's diagnosis had been accepted too quickly. The history turned out not to be the typical one. The child had been hurt at play with older children and there was no clear-cut story of a pull. This time he was sent on to an orthopedist, who found nothing on x-ray. He put the arm up in flexion for a few days, after which time it was well again. This may or may not have been a subluxation. My manipulation certainly failed to reduce it, but it is known that rest in the flexed position will usually result in spontaneous reduction within a few days.

One Sunday morning my own little girl, aged 2, got under the dining room table and refused to come out, so the nurse pulled her out by the arm. The child immediately cried with pain in the arm and refused to use it. I tried to correct it in the usual way without success and then, fearing that my diagnosis was wrong, had an x-ray taken, which revealed nothing. The child was so uncomfortable that some aspirin was given under considerable protest. During its administration the child kicked and fought and pushed the spoon away with all her might. Immediately after she finally did swallow the drug she used the arm and said the aspirin had cured her. She, of course, slipped the subluxation back into place by her own efforts.

Here is the history of another little girl about 2 years of age who had an accident. This time the father said he saw a heavy object fall on the arm. He did not remember just how he had helped her to her feet. The presenting picture was about the same, although in the light of further study my examination could have been more thorough. Manipulation gave no relief and because the history was not typical I did not persist. Palpation along the lower radius was definitely painful, and a green stick fracture was shown by x-ray to be present in this area. Too forceful manipulation could have caused a complete break.

These cases are cited to illustrate several important points. A careful history is extremely helpful. If the history is clearly not one of a sudden pull on the extended arm the probabilities are against a subluxation. If the history is unobtainable, as is often the case when children are hurt at play, it is wise to rule out fractures and dislocations first in order to avoid doing further injury. With a pretty good history but failure of easy reduction, it is safe to put the arm up in flexion and watch it. The condition may correct itself as with my own child and in another child seen recently.

The frequency with which subluxation occurs must be fairly high. Not having a diagnosis file to refer to, it is imposible for me to be accurate with regard to my own practice. I am able, however, to remember 13 instances in the last six years and I believe I have overlooked a few. Only one of these was seen in a clinic; all the others were private patients. Of course this is a very small percentage of the total work done in this period. If, however, accidents alone are considered the incidence is greatly increased. Van Arsdale reported 100 cases seen by him over a period of two years and said that the incidence was 1 per cent of purely surgical cases seen. The average age was 2¼ years. The youngest was three months and the oldest 9 years.

As is the case with many conditions in medicine, the diagnosis of subluxation of the head of the radius is not particularly difficult once one thinks of the possibility. As mentioned above, a sudden pull of the extended elbow seems to be necessary to bring it about. The characteristic position of the arm is that of hanging rather limply from the shoulder with the elbow flexed at 10 to 15 degrees and the wrist held in mid-position between pronation and supination. In my experience the child is usually too small or too tearful to be of much help in indicating where he hurts. If this information can be elicited it will usually be found to be at the fold of the elbow, although it may be at the wrist. In the latest case seen about two weeks

ago the mother stated that the child sometimes complained of pain at the elbow and sometimes at the wrist. Pain at the wrist should, of course, be investigated as in the case cited above, in which the radius was fractured. It should at the same time, however, lead one to suspect a subluxation. There is a point of acute tenderness over the head of the radius. Complete flexion and complete extension are moderately painful, but passive motion through an arc of about 130 degrees is painless. Complete pronation is slightly painful. Attempts at supination meet with an abrupt obstruction about midway and the child simultaneously cries violently with pain. No deformity can be demonstrated at the elbow or elsewhere. There is no tenderness anywhere except over the head of the radius. The only time I have had an x-ray film made it was of the affected arm only and no abnormality could be demonstrated. As pointed out by C. A. Stone in 1916 (*J.A.M.A.* July 1), if both elbows had been taken and the two compared, a difference might have been demonstrable. In a case he showed the head of the radius on the affected side to be farther from the capitellum than on the good side, but this difference was slight.

Just what happens anatomically in subluxation of the head of the radius has not been definitely determined apparently. There has been considerable speculation and some experimentation, however. Experiments by C. A. Stone showed to his satisfaction that the annular ligament slips over the head of the radius when the hand is held in pronation. It was not necessary for it to be fully extended. Supination is then resisted because

> "the tense lateral ligament forces the flattened side of the radial head against the anterior edge of the lesser sigmoid articulation and the inner attachment of the annular ligament. Attempts at this motion throw the exposed two-thirds of the long axis of the head against an already tight ligament, making it more tense."

Dr. Stone's paper seems to me to be rather convincing, but not being an anatomist or orthopedist I am not in a position to discuss it further. I hope that further light along this line will come out in the discussion.

The manipulation for correcting this condition is rather simple in most cases. But in others, as with my own child, it may not be easily accomplished. The elbow is flexed to 90 degrees or beyond while one thumb is placed over the head of the radius. The forearm is extended somewhat and supinated forceably beyond the obstruction mentioned above. At the same time it is well to make some pressure upon the head of the radius. If successful there will be felt a distinct click under the thumb at the elbow. After this, all movements are usually free and painless, although the tenderness over the head of the radius may remain. The feeling of this click is important because without it one cannot be sure of a reduction. With it you can be reasonably sure, although the child may not use the arm immediately. In my experience when the injury has not been long standing the arm is used at once. If it has gone overnight or longer he is either still afraid to use it or enough surrounding reaction has taken place to make the pain continue for a while. It may not be absolutely necessary to put the arm at rest, but this is best for fear of a recurrence before complete healing has taken place. A sling is all that is necessary. This is particularly true of thin, rather poorly muscled children. If the manipulation is not followed by the click and immediate relief, the arm may be put up across the chest in flexion and the condition will probably correct itself in a few days.

SUMMARY

Subluxation of the head of the radius has been described. Its incidence is about 1 per cent of surgical cases in children under 9 years of age. The large majority of the cases are under 3 years of age. The exciting cause is sudden traction of the extended arm. The symptoms and signs are: loss of use; absence of deformity; tenderness over the head of the radius; limitation of complete flexion and extension by pain, and especially limitation of complete supination by an obstruction and exquisite pain. Reduction is accomplished by forced supination with the forearm flexed at 90° or more. At the moment of reduction there is felt a click at the elbow, and thereafter all movements are free and painless.

DISCUSSION (*Abstract*)

Dr. J. Warren White, Greenville, S. C.—A man whom I consider an expert has just told me something of his research upon this problem twenty-five years ago, in 1916.

There must be some reason why the condition exists only in very young children. It rarely occurs beyond the age of 2½ or 3 years. Dr. Stone, of St. Louis, believes there are two factors that explain this. One is that the head of the radius is small; the other is that there is more relaxation of the interosseous membrane at that age than when the child gets older.

It has been seen in the x-ray that when the radial head is subluxated or dislocated, I think it is really a dislocation rather than a subluxation, there is more interarticular space than there is in the normal arm. As the child's arm is pulled out, this knob-like radial head is pulled through the orbicular ligamentous ring, so that it is caught on the wrong distal side. As we grow older, that head gets larger and it cannot be pulled through. Also, the interosseous ligament between the ulna and the radius is more rigid, and has not the sliding motion that allows that force to be exerted. So when the child is in the uncomfortable, tearful condition you saw, the radial head is on the wrong side of the annular ligament.

I cannot believe, when there is prompt and complete recovery and early reduction, that there has been any real tearing. I do not think the annular ligament could be torn, because the child's arm would be sore for a long time. Of course, if it is out for twenty-four hours, you have the part stretched and naturally it is sore for some time.

In a large proportion of the cases you can feel the distinct impulse of the head sliding through the ring and back where it belongs.

This is a pediatric problem rather than an orthopedic one, because the condition is relatively minor and it corrects itself. It must happen many times when we do not know it. We orthopedists see very few of them.

Dr. Arthur G. Quinn, Memphis, Tenn.—The incidence of this condition in our practice is not so large as 1 per cent. I think I am safe in saying all of our cases come to us when the accident occurs.

It has been our experience that it is always due to the mother or some one's holding the child's hand while walking along or going up steps. The child begins to fall, the attendant holds on to the hand in an attempt to support the child, and the subluxation results.

We have taken x-ray pictures of both elbows and can find no abnormality in the location of the bones.

Dr. Anderson's description of the position of the child's arm, and the history, is diagnostic of the condition. The exact pathology cannot be determined. It must be a slipping of the head of the radius in the annular ligament.

My attention was first called to this condition in my first year of practice by Dr. Eugene Rosamond. The methods of reduction as outlined by Dr. Anderson are the only ones that give good results. We have been able to reduce the subluxation without getting the "click," but usually if the proper application of the left thumb over the head of the radius is made, with gentle maneuvering of the lower end of the ulna and radius, reduction is quite simple. When reduction takes place there is no further evidence on the part of the child of the subluxation.

I have always felt that this was a pediatric problem only.

Dr. Anderson (closing).—I believe Dr. Stone says that the position of pronation is necessary to bring about subluxation. The shape of the head of the radius is such that in pronation it slips out a great deal more easily than if the pull is made while the arm is in supination.

THE PROPHYLACTIC USE OF VITAMIN K IN OBSTETRICS*

By L. M. HELLMAN, M.D.

and

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In 1937 Smith[3] and his co-workers demonstrated that the plasma prothrombin levels of newborn infants were only 14 to 39 per cent of the normal adult value. These findings were confirmed by Moore and Javert[11] and by ourselves,[7] as shown in *Table 1.*

Unfortunately Quick[13 14] and others, using a modification of Howell's prothrombin time technic, rather than the more elaborate titration method of Smith, are not in agreement with these observations. On the contrary, they believe that the infants' prothrombin time is nearly normal at birth, but falls within the first forty-eight hours of life and then gradually returns to normal. However this controversy may be decided, it is clinically evident that newborn infants have a tendency to bleed. This fact attains its most striking expression in hemorrhagic disease of the newborn, but is also apparent on examination of the retina, spinal fluid, or meconium. The correlation between the laboratory findings of low prothrombin levels in the newborn, and the tendency to bleed, takes on added significance when one realizes that the amount of prothrombin, within limits, is directly proportional to speed of clotting and the strength of the clot. This was expressed by Howell recently in the following equation:

Prothrombin + Ca ions + Thromboplastin = Thrombin

Thrombin + Fibrinogen = Clot

While hemorrhagic disease of the newborn is relatively uncommon, occurring only once in some two hundred deliveries, and then not always with fatal results, the tendency of infants to bleed is responsible for a substantial number of neonatal deaths and stillbirths. In fact, of the 128,000 infants born every year who do not survive, 20 to 40 per cent show evidence of cere-

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bral hemorrhage. Little could be expected from improvement of the clotting mechanism in face of injury to large cerebral vessels, but control of multiple oozing bleeding points might result in the saving of infant lives. The child who is born limp and pallid, and who is slow to breathe, who continually requires oxygen, and whose high pitched cry betokens cerebral damage, might be saved if some improvement in its clotting mechanism could be achieved prior to the occurrence of extensive cerebral damage. If, for example, the prothrombin level could be raised prior to birth, or even during labor, a reduction in the infant mortality might be expected.

That hypoprothrombinemia induced in animals by means of inadequate diets can be controlled by the administration of fat soluble vitamin K was demonstrated by Dam[4] in 1937. The rest of this story is well known to you. Waddell was quick to see the possible therapeutic application of this vitamin in hemorrhagic disease of the newborn, and his excellent paper in 1939 demonstrates the effectiveness of its use. Snell and his co-workers at the Mayo Clinic showed how adequately the hypoprothrombinemia accompanying obstructive jaundice could be controlled with vitamin K. You know, too, of the rapid discovery of the chemical formula of the vitamin by Doisy,[2] [12] of this city, and finally of its synthesis by Doisy and independently by Fieser.[5] Our own interest centered in the control of low prothrombin levels of the newborn prior to birth. The results of these investigations[6] [8] [10] have been published, but may be summarized in *Table 2*. They clearly show that the plasma prothrombin level of the newborn infant can be

THE PLASMA PROTHROMBIN LEVELS OF MOTHER AND CHILD, EXPRESSED IN DILUTION UNITS, IN THIRTY-ONE FULL-TERM DELIVERIES

Name	Race	Infant Weight	Prothrombin Dilution Units	
			Mother	Infant
C. B.	W.	3,660	138.9	39.2
Z. B.	C.	2,285	202.9	13.7
R. B.	W.	4,010	201.2	33.8
E B.†	W.	2,880	92.4	28.2
		2,800		26.8
N. B.	C.	3,305	157.0	41.3
N. B.	C.	3,600	45.0	14.0
M. C.	C.	4,075	99.0	36.5
M. C.	W.	3,120	45.8	14.8
N. E.	W.	3,290	130.6	26.8
B. F.	C.	2,465	237.6	60.4
M. G.	C.	2,535	173.2	32.2
J. G.	W.	3,620	129.8	15.0
E. H.	W.	3,550	124.4	25.6
B. H.	W.	3,800	150.5	28.6
A. I.	W.	2,360	149.9	32.6
E. J.	C.	3,040	151.8	34.4
D. J.	C.	3,000	85.0	14.9
M. J.	W.	3,850	295.4	36.0
R. K.	W.	3,310	129.8	62.5
S. M.	C.	3,180	61.6	21.3
E. R.	W.	3,920	85.8	20.0
E. S.	W.	2,670	123.8	22.4
M. S.	W.	3,110	144.0	34.4
C. S.	C.	2,760	117.0	28.4
B. T.	C.	2,675	46.2	14.2
M. T.	W.	3,700	189.0	33.7
A. W.	C.	2,675	99.8	33.8
P. W.	C.	3,775	79.2	20.5
R. W.	C.	3,010	164.3	26.6
E. W.	C.	2,470	124.4	27.7
G. Z.	W.	3,400	97.4	13.8
Average		3,201.2	131.4	28.6

Table 1*

*From *Shettles, Defts and Hellman:* Bull. Johns Hopkins Hosp., 65:419, 1939.

†Double ovum twins.

THE PLASMA PROTHROMBIN LEVELS OF MOTHER AND CHILD, EXPRESSED IN DILUTION UNITS, IN 14 FULL-TERM DELIVERIES, FOLLOWING TREATMENT OF THE MOTHER WITH 1 MG. OF 2-METHYL-1, 4-NAPHTHOQUINONE DURING LABOR

Name	Infant Birth	Weight 9th Day	Hours from Onset of Treatment to Delivery	Prothrombin Dilution Units		
				Mother Prior to Treatment	Mother at Delivery	Infant at Delivery
E. J.	3,700	3,640	14 10/60	146.3	202.1	94.8
S. A.	3,170	3,000	13 28/60	175.2	209.9	64.4
G. G.	2,270	2,500	12 18/60	117.3	188.2	56.7
E. H.	3,330	3,320	4 54/60	174.0	207.7	60.4
A.H.	3,000	2,890	3 40/60	143.9	162.3	53.9
V. A.	2,730	2,780	3 30/60	139.3	166.7	43.2
M. B.	2,975	3,010	3 28/60	154.0	175.2	46.6
E. L.	3,210	3,300	3 1/60	186.0	251.0	69.4
M. W.	3,470	3,650	1 30/60	142.9	190.2	60.7
S. L.	3,190	3,230	1 18/60	161.2	188.2	46.7
A. C.	3,425	3,350	1 5/60	237.3	256.0	72.0
N. K.	3,030	3,065	1 1/60	131.6	182.3	68.4
V. F.	2,460	2,740	1 1/60	214.2	259.2	49.3
E. W.*	4,200	4,345	41/60	186.7		13.9
Av.	3,073	3,113		163.3	203.0	60.5

*Not included in the average, as duration of therapy was too short.

Table 2

raised by the administration of vitamin K active substance to the mother during labor; the same elevation of infant plasma prothrombin can be obtained, of course, by prolonged administration of the vitamin prior to the onset of labor.

While these figures were most gratifying, the final proof that such therapy is of value in the saving of infant lives, awaited two developments. First, demonstration that it reduces or eliminates the hemorrhagic tendency; and second, evidence that it actually lowers stillbirth and neonatal mortality rates.

Beginning September 1, 1939, every other ward patient admitted to the delivery floor of the Johns Hopkins Hospital was given 2 mg. of 2-methyl-1, 4-naphthoquinone by mouth. This preparation, discovered by Ansbacher,[1] was known to be approximately four times as potent as the synthetic vitamin. While there is a certain moral responsibility in the conduct of such a one-to-one experiment, this was far outweighed by technical difficulties that must occur to you at once. The very nature of obstetrics makes it manifestly impossible to keep the series equal. We have tried, however, to keep the requirements to a minimum, namely: that the fetal heart should be audible on admission, that the baby should weigh 1,000 grams or over, and that the drug be given at least two hours prior to delivery. The alternate cases were chosen by the head nurse purely on the order of admission. No other correction according to type of case was consciously made, nor have the results been subsequently corrected. Due to lack of time, and in consideration of your interest, I will refrain from analyzing the entire series, but will merely say that on August 1, 1941, 1,042 mothers had received treatment, while 1,206 served as the controls. Within the limits of error these two series were similar in regard to race, parity, age, obstetrical complications, forceps, toxemia, and so on. Unfortunately, the series are dissimilar in two respects, namely: the incidence of prematurity and cesarean section. These will be discussed later. Before continuing further, it might be well to inquire if any ill effect could possibly accrue from the use of such a drug. We have been studying the effects of various vitamin K active substances since 1937, and have never noticed any harm either to mother or child. There has been a decrease in the incidence of thrombophlebitis in the clinic during this period, and in the above-mentioned series the condition occurred only once in the treated group as compared to five times in the control cases. There were two maternal deaths in the series under discussion, both occurring in the treated group. Autopsy in each instance revealed adequate cause of death without implicating vitamin K. During the period of the experiment there was a reduction both in the stillbirth and neonatal death rates, as will be reviewed in detail presently. The infant deaths in the treated cases could hardly have been explained on the basis of vitamin K therapy. The infants in both groups gained weight and behaved normally.

In order to investigate the effectiveness of vitamin K therapy in the obliteration of the hemorrhagic tendency, the retinae of a number of infants in both groups were examined. The results of these studies have already been published,[9] but in summary they showed that, while retinal hemorrhage occurred in 25 per cent of the infants in the control series, it was reduced to 15 per cent in the treated group. The investigators felt that the failure to achieve a more striking result could be due either to the occurrence of the hemorrhages prior to the initiation of the therapy, or to failure of the small amount of vitamin K to elevate sufficiently extremely low initial infant prothrombin levels. To prove this, 50 mothers were given 2 mg. of 2-methyl-1, 4-naphthoquinone daily for four days prior to the onset of labor. The results for twenty-nine deliveries are shown in tabular form in *Table 3*. By this method of therapy the incidence of retinal hemorrhage was reduced to 4 per cent.

Finally, the effect of vitamin K therapy on the stillbirth and neonatal mortality rates is shown in *Table 4*.

The uncorrected mortality in the treated group was 1.9 per cent, while that of the control series was 3.9 per cent, a decrease of 2.1 times in favor of the treated series. Statistically the difference in the two percentages is 2.8 times the standard deviation of the difference. The odds against such a result's happening by chance are 194.7 to 1. As stated before, however, the two series were not exactly similar. In the treated group there were 26 cesarean sections, with an infant mortality of 12 per cent, while in the control series there were 100 cesarean sections with an infant mortality again of 12 per cent. Inasmuch as the percentage infant mortality is the same for both groups, the difference in number of cases can be ignored. There were 49 infants weighing under 2,500 grams in the treated group, as compared with 88 in the control. The

mortality rates were 16 and 22 per cent, respectively. The dissimilarity here certainly weighs the results in favor of the treated group. The simplest statistical maneuver is to re-examine the figures after removing all of the premature and cesarean section cases. The results of such calculations give an infant mortality for the treated and control groups of 1.2 and 2.4 per cent, respectively, a differential of 2 to 1 in favor of the vitamin K series. Statistically, the differences between the two percentages is still significant.

THE PLASMA PROTHROMBIN LEVELS, EXPRESSED IN DILUTION UNITS, OF TWENTY-NINE INFANTS BORN OF MOTHERS TREATED WITH TWO MILLIGRAMS OF 2-METHYL-1, 4-NAPHTHOQUINONE, BY MOUTH, FOR FOUR DAYS BEFORE DELIVERY

History Number	Infant Weight	Type of Delivery	Duration of Labor		Prothrombin Dilution
			Hours	Minutes	
	grams				*units*
204688	3400	Operative	4	25	64.3
189271	3370	Operative	5	25	62.3
170828	3360	Operative	16	19	64.3
204630	2930	Operative	6	54	56.1
194719	3200	Operative	4	25	55.1
136220	3390	Spontaneous	4	40	48.7
189374	3460	Spontaneous	8		56.1
194096	3330	Operative	8	5	66
165304	3260	Spontaneous	1	50	60.4
191558	3770	Operative	3	41	59.4
194586	3030	Operative	11	18	68.8
192275	3290	Operative	5	13	63
191558	3560	Operative	5	30	62.7
200092	3260	Spontaneous	3	50	72.6
113461	3920	Spontaneous	1	9	64.4
199442	3200	Operative	6	3	58.5
133777	3880	Spontaneous	2	35	71.5
191702	3670	Spontaneous	6	6	56.2
207595	3260	Spontaneous	5	54	47
201562	3270	Spontaneous	24	42	36.4*
143422	3130	Spontaneous	9	35	50
132323	2870	Spontaneous	5	40	56.3
200475	3220	Spontaneous	5	50	55
201220	2600	Spontaneous	6	57	53.8
179165	2580	Spontaneous	5	53	55.0
201092	2880	Spontaneous	6	37	48.1
210104	2970	Spontaneous	5	59	50
129325	3920	Spontaneous	2	15	61.8
160531	3300	Spontaneous	10	41	4.4*
Av.	3285.5				56.1

*Had retinal hemorrhage.

Reprinted from: Bull. Johns Hopkins Hosp., **68**:158-168, 1941.

Table 3

STATISTICAL COMPARISON OF STILLBIRTH AND NEONATAL MORTALITY RATES BETWEEN THE TREATED AND UNTREATED SERIES

September 1, 1939-August 1, 1941

Mothers receiving 2 mg. of 2-methyl-1, 4-naphthoquinone 2 hours or more prior to delivery	Mothers receiving no therapy
1042 deliveries	1206 deliveries
20 infant deaths	47 infant deaths
1.9 per cent mortality	3.9 per cent mortality

Standard deviation of difference, 0.721 per cent

Difference of percentages, 2

Difference is 2.8 times standard deviation

The odds against such a difference occurring by chance are 194.7 to 1

Table 4

In conclusion, evidence has been presented which strongly suggests that a certain number of infant lives can be saved by the administration of as little as 2 mg. of 2-methyl-1, 4-naphthoquinone to mothers during labor. While this method of therapy is adequate, consideration of the study of the effect of such treatment on retinal hemorrhage would indicate that more prolonged therapy prior to the onset of labor ought to be more satisfactory. Accordingly, it is our recommendation that mothers should receive 2 mg. of 2-methyl-1, 4-naphthoquinone, or a similarly potent vitamin K active substance, every day for at least two weeks prior to the onset of labor.

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DISCUSSION (*Abstract*)

Dr. Ralph A. Reis, Chicago, Ill.—I still have the concept that the majority of the babies that have hemorrhage have it not from a diathesis or avitaminosis or deficiency, but from trauma. I should be very unwilling to see disseminated in this audience the idea that by giving vitamin K we can be more glib in our operative obstetrics: that we shall not get hemorrhages if we increase the prothrombin level.

I should like to see a very much larger series of newborn retinas examined before I would be willing to say that the reduction of retinal hemorrhage is as great as Dr. Hellman observed. Others have spent much time looking at retinas and have often run into 20 or 30 without any hemorrhage and then into 8 or 10 or 12 with it.

This work is distinctly worth while, but I think we need much more of it before we can or should indiscriminately give all our women in labor vitamin K.

Dr. Louis Douglas, Baltimore, Md.—I feel that Dr. Hellman has been extremely conservative in his statements today. It has been my pleasure to watch Dr. Hellman work from the onset. His results have been even more striking than he has told you. He has the true scientific standpoint of not wishing to say too much and not wishing to paint the picture too rosy, but actually we have seen individual instances that were little less than marvelous in the response of these patients to vitamin K.

I should like to ask Dr. Hellman if he knows anything about the influence of mineral oil in preventing the absorption of vitamin K from the intestinal tract. There has been some little work done on that recently and there has been a suggestion that we discontinue the use of mineral oil in the latter weeks of pregnancy for this reason.

Dr. Hellman (closing).—In response to Dr. Reis, I am sorry if anybody thinks that he can increase the incidence of mid-forceps or even high forceps just by administering vitamin K and still get living babies. I did not mean to imply that at all.

As you understand, the two series were carried on in the same clinic. We did not change our policy between the control series and the treated series. As nearly as possible we attempted to set up a statistically valid experiment. I thought a thousand cases were enough, but I am glad to say that we are not the only ones who have carried on this experiment. Dr. Beck, at Long Island College Hospital, using three different hospitals, conducted a similar experiment. The results of his work are known to you, but he made the statement that he reduced his infant mortality by as much as 3:1.

In response to Dr. Douglas, I do not know about mineral oil. Dr. Javert has just published a paper suggesting that the taking of mineral oil might prevent the absorption of vitamin K, because the mineral oil would absorb all of the vitamin K and the patient would get none. I should think that if mineral oil were taken at the same time that the patient was given vitamin K this might be so. We have on the market at the present time many water soluble compounds which are equally active and can be given either intramuscularly or intravenously. If there is anything in the mineral oil problem it might be answered this way.

THE CARE OF PREMATURES IN A SMALL HOSPITAL*

By J. Lewis Blanton, M.D., F.A.A.P.
Fairmont, West Virginia

Great improvement has been made in the care of prematures in large hospitals and maternity centers. Numerous reports show the marked reduction in mortality that has resulted from the practical application of the scientific data that we now have regarding premature infants and their care.[1] Yet, in spite of the reduction in mortality reported from large centers, the mortality of prematures for the county as a whole remains very high. Dunham and Bierman[2] have stated that at least 5 per cent of all infants born alive are premature at birth and that the neonatal mortality for the premature group is 13.8 deaths per 1,000 live births.

The number of births occurring in small general hospitals is increasing each year. The number of prematures cared for in these hospitals is also increasing, both from the increased birth rate in the hospital and also because more prematures are being brought to the hospital for supervision.

In order to see how our hospital, which may be taken as an average institution in a small town, was handling this problem in comparison with larger institutions, this study was made. A period of 10 years, extending from July 1, 1931, to July 1, 1941, was chosen for the study because it splits into 5-year periods when the interest in the premature problem changed considerably.

The records of the former Cook Hospital and its successor, the Fairmont General Hospital, form the basis of this report. Each institution may be taken as representing a community hospital of 100-bed capacity. No special space of built-in equipment is provided for the care of prematures. All newborns, premature and full-term, are cared for in the newborn nursery by

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the same personnel. A nurses' training school is conducted by the institution and student nurses are used in the newborn nursery under the supervision of a graduate supervisor. Premature infants born in the home were formerly cared for in the newborn nursery. This practice has been discontinued and all infants born outside the hospital are now admitted to the pediatric department.

Our hospital has always maintained an open staff. Members of the staff care for their patients with few rules or regulations to guide them. Most deliveries are made by general practitioners who continue the supervision of the baby while it is in the hospital. However, most of the prematures are referred to a pediatrician for supervision.

During the first five years of this 10-year period, no special interest was manifested in the premature problem. There was a Nobel box and an old style Hess incubator that constituted our premature equipment.

During this period there were 657 live births, 29 of which were premature. Sixteen of the 29 infants died during the first 24 hours of life, giving a mortality of 62 per cent. The remaining 13 were given premature care for a period of 2 to 8 weeks with a mortality of 2, or 15 per cent. The neonatal mortality for this group was 27.4 deaths per 1,000 live births. Every infant showing signs of life at birth is included in this study. A few lived only a short time following delivery.

Five years ago both the medical staff and the nursing staff became concerned over the premature situation. It was decided to send our supervisor away for special obstetrical and nursery training and to establish a routine that would in effect give prematures the care they receive in larger institutions.[3] No effort was made to change the individual supervision of the premature infant as far as the physician was concerned, but certain routine measures were established that definitely improved the hospital care of the premature group.

The first change was to eliminate contact infection as far as possible. All nursing personnel in the nursery must be free of infection, especially head colds. Both physicians and nurses entering the nursery are required to wear gowns and masks. Hand scrubs and lysol solution is used routinely before touching a newborn baby. All newborns are received in a warm sterile blanket and the prematures are placed immediately in an incubator following the tying of the cord and the instillation of silver nitrate drops in the eyes.

Due to lack of funds, a home-made type of incubator was constructed of plyboard. It is heated by electric bulbs in such a manner that the humidity can be controlled. This box has largely supplanted the old equipment. It has been successful enough to warrant the construction of a second box and also the purchase of an incubator with automatic heat and humidity control. However, the nursing personnel still prefers the box type of incubator because it affords better observation of the baby.

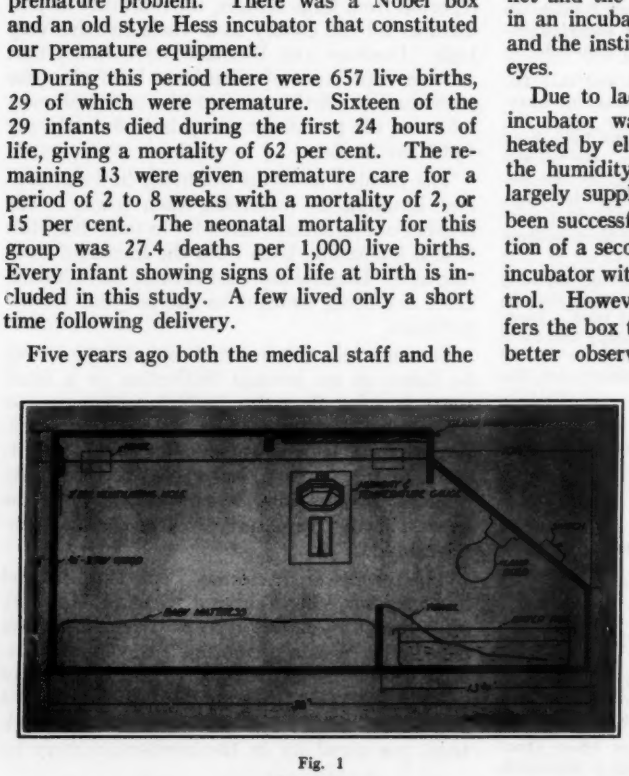

Fig. 1

PREMATURE BOX

Three-eighths inch, three plywood is used throughout. Inside of box lined with transite board, which is heat-absorbing and thus aids in heat stabilization. Five electric bulbs, 10, 15, 25, 30 and 40 watts, provide heat. Paper towel placed in pan of water aids in maintaining proper humidity.

Every effort is made to prevent chilling. Rectal temperatures are taken at 1 to 4-hour intervals and the incubator temperature is so regulated that the rectal temperature of the baby will remain between 98° and 100°.

Prematures are handled as little as possible and yet they are kept under close observation for asphyxia, cyanosis, hemorrhage or other trouble. After an initial period of adjustment when the rectal temperature is 99° or above, the baby is removed from the incubator, cleansed, oiled and weighed. Thereafter the baby

remains in the incubator unless the attending physician orders differently.

As the baby gains in weight the incubator temperature is lowered until finally the baby is in the incubator without heat. If he can maintain his own temperature and also gain in weight, he is then removed from the incubator to a bassinet and given the usual newborn nursery care.

Some of the babies are dressed and some are not, depending upon the choice of the attending physician. They seem to do equally well with or without clothing as long as the rectal temperature remains within normal limits.

Aseptic nursing technic is carried out as long as the babies are in the incubator. The attending nurse uses a gown kept for that particular infant. The doctor uses a fresh gown for each examination. Masks are worn and hand-scrubs insisted upon before the baby is touched. The diapers are sterilized for all infants. The parents can view the infant only through a glass partition. In spite of this routine, two of the premature infants developed upper respiratory infections with complications.

The fourth routine procedure regards feeding. All prematures are now started on breast milk. The fact that 70 per cent of the prematures in this report were started on breast milk indicates that it is not a very difficult problem to beg, borrow or steal enough breast milk to get a premature started.

The baby is not given anything for the first 12 hours. Breast milk diluted 50 per cent is then started in dram doses every three hours and increased gradually until the fluid requirement is met. Then the strength of the feeding is increased to whole breast milk and the quantity increased to provide a gain in weight. This is usually 50 to 60 calories per pound of body weight, although some prematures will require more in order to gain. The caloric value of the milk can be increased by adding "dryco" or "casec" without increasing the quantity.

After the baby is thriving it can be switched to any appropriate type of formula. This should be done gradually by alternating the new type of food with the breast milk for 24 to 48 hours. The type of artificial feeding makes little difference in our experience. The main problem is to be guided by the baby's digestive ability and to avoid digestive upsets. Weaker mixtures than the baby actually requires to gain in weight are always used when changing from one type of food to another. As the baby becomes used to its new diet, the caloric content can be raised until a satisfactory gain in weight is obtained. This is strictly an individual matter and must always be handled as such.

The technic of feeding is also important. Many prematures are too weak to nurse. Many will not take sufficient food by dropper or bottle without regurgitating or getting cyanotic. Therefore, gavage feedings are used on all small prematures. Gavage feedings are simple to carry out and save the infant considerable work. Oral gavage is used entirely. When the infant begins sucking on the gavage tube and is gaining satisfactorily, a Breck feeder is substituted and finally bottle feedings are given.

As the infant begins to thrive, vitamins A, C and D are added to the formula and by the time the infant is ready to leave the hospital iron in some form is also given. This will prevent the anemia that follows frequently in prematures.

All infants now get vitamin K routinely following birth. Reports[3] show that not only is hemorrhagic disease prevented, but that the incidence of intracranial hemorrhage is greatly reduced. This should further reduce premature mortality, since intracranial hemorrhage is a frequent cause of death in these small infants.

Oxygen therapy is also provided for all weak prematures and those having cyanotic attacks. "Coramine" is commonly used in treating such attacks also.

Parenteral fluids and blood transfusions are given when indicated. Many prematures that fail to begin gaining promptly will get quite a boost from a blood transfusion.

Since adopting the above routine, there have been 1,229 live births, 59 of which were premature. Nineteen prematures died during the first 24 hours, giving a mortality of 32 per cent, or approximately one-half our former mortality. Our neonatal mortality was reduced to 17.9 deaths per 1,000 live births. While this is still too high, we feel definite progress has been made and anticipate a better record with the physical equipment provided by the new hospital now occupied for only one year.

Another premature problem confronting the small hospital is the care of home-born prematures. Many of these infants are hospitalized only after trouble arises. This inevitably means a high mortality. Successful premature care must avoid upsets of all kinds. Chilling, improper feeding and contact infections are the

PREMATURE BIRTHS

1931-36		1936-41
657	Total Live Births	1229
29	Premature Births	59
16 (62 per cent)	Mortality First 24 Hours	19 (32 per cent)
18	Neonatal Mortality	22
27.4	Rate per 1,000 Live Births	17.9

most frequent complications present on admission. Prematures born in the home should be hospitalized promptly, yet many are admitted after several days or even weeks of attempted home care.

We have had 35 home-born prematures admitted during the first week of life. Seventeen, or 50 per cent, of these infants died on the day of admission to the hospital. Eighteen lived to receive premature care beyond the day of admission, but 4 of these, or 22 per cent, died during hospitalization. This mortality is three times as high as the mortality for hospital-born prematures.

HOME-BORN PREMATURES

Admitted First Week	Mortality Day of Admission	Neonatal Mortality
35	17 (50 per cent)	21 (60 per cent)

This situation is distressing. It places squarely before us a problem existing in the semi-rural areas that desperately needs attention. Many states are setting up programs leading toward a solution of this problem.[4] In West Virginia an electric type of incubator for home use has been placed with each county health unit, where it can be obtained promptly for home supervision of prematures. These boxes are being used very infrequently. They represent a step in the right direction, but more must be done than simply making a suitable type of incubator available. We must inform physicians as well as laymen that a premature baby requires expert care, particularly nursing care. We must impress them with the fact that very small prematures need prompt hospitalization. These infants must be treated as emergencies and rushed to the hospital where a trained force is ready to administer to them before difficulties arise.

In order to meet this need the small hospital must set up proper equipment, must provide expert nursing care under the supervision of some one interested in the premature problem. If at all possible an expectant mother going into premature labor should be hospitalized if for no other reason than the care of her immature baby. Hess[5] has demonstrated what can be done when a community is sufficiently aroused. We need not construct premature centers, as was done in Chicago, but we should and must utilize the facilities already present in every community. With very little expense, a good premature station can be established in every small hospital.

Supervision of these centers will be needed. The department of maternal and child welfare now functioning in every state can provide this supervision. They can assist also in setting up the proper program where such ground work is needed. Not only will the premature care be greatly improved, but the newborn nursery care also will inevitably be benefited.

COMMENT

It is true that our mortality is far from satisfactory, but we are making progress. Still more will be accomplished by the cooperative effort now being made to meet the problem. Clifford,[6] Breese[7] and others have shown that the largest single factor involved in premature mortality is the size of the baby. Our records substantiate this fact.

MORTALITY BY WEIGHT

1 to 2 lbs.	Mortality
1	1 (100 per cent)
2 to 3 lbs.	
11	3 (28 per cent)
3 to 4 lbs.	
16	2 (12 per cent)
4 to 5½ lbs.	
43	3 (7 per cent)

This relationship of weight and mortality indicates that the premature problem cannot be solved without the cooperation of the obstetrician. He is the important person in the prevention of prematurity. He is also the final judge when there are indications for the interruption of pregnancy. He also makes the choice of the method of delivery and the use of oxytocic drugs and morphine before the birth of the infant. These are all important factors in the obstetrical side of prematurity and have a direct bearing on premature mortality, as Clifford[6] and others have brought out.

A successful premature program in any hospital means teamwork by all parties concerned.

The obstetrical staff, the pediatric staff and the nursing staff must work hand in hand. The simple principles of premature supervision must be thoroughly understood and efficiently carried out. Danger signals must be watched for and prompt treatment instituted. When such a cooperative program functions smoothly, premature mortality most certainly will show a decline.

CONCLUSIONS

An effort has been made to show the trend of premature mortality in a small hospital where the simple principles of premature supervision have been established. The equipment needed is inexpensive. A trained nursing personnel under competent supervision is essential. Cooperative effort is the important keystone of a successful program.

Small hospitals scattered all over the country should be an integral part of the national program for premature supervision. Improved premature care will lead to improved newborn nursery care and this will still further reduce the neonatal mortality.

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DISCUSSION (*Abstract*)

Dr. Harvey F. Garrison, Jackson, Miss.—It is impossibe to imagine that any premature could be cared for as well in the home as in a hospital with adequate facilities and trained nursing personnel under the supervision of a pediatrician. Dr. Blanton has enumerated the many advantages of a hospital regime for the care of the premature.

He mentioned the national program for premature supervision. A program of this sort is very much needed. It is true that the mortality rate of the newborn has been considerably reduced, yet it is still much higher than it should be. Many of us realize the necessity for pediatric supervision and trained nursing personnel to help solve the premature problem in our nation. It might be well for this Section to think seriously about the advisability of selecting a committee to cooperate with other committees to study a plan which would be applicable to the small as well as the large hospitals. There are some potential liabilities to a Federal aid program. The committee could offer some restrictions that would safeguard against these liabilities if such recommendations should become effective. Since we, as pediatricians, are in possession of the knowledge necessary to a solution of this problem, it would seem, therefore, that the baby is on our doorstep. What shall we do with it?

Dr. Hugh Leslie Moore, Dallas, Tex.—Dr. Blanton's very commendable paper describing his dramatic success in reducing the mortality rate among prematures is very impressive since it occurred in a small hospital with only simple equipment.

It is worth while to reiterate the cardinal points stressed by the essayist. Adequate nursing care is of first importance. Maintenance of the infant's body temperature is second. Proper feeding, especially the avoidance of overfeeding, comes third, and last but not least the avoidance of infection, including the skin. Of great value in the prevention of infections, hemorrhages and inanition is the administration, by intramuscular injections, of 4 to 8 c. c. of fresh human blood every 12 to 24 hours as suggested by Hess. Because of its simplicity of administration and its great therapeutic value, I recommend it for routine use in prematures weighing two to five pounds.

I would further urge the intravenous administration of one to two mg. of vitamin K to the mother at the first suspicion that a premature delivery is threatened. This will frequently prevent a cerebral hemorrhage which commonly causes the death of prematures. In addition it is also important to administer vitamin K to the premature infant as early as possible.

Mother's milk is of greatest value; yet it frequently is necessary to add an additional amount of protein and carbohydrates to bring the formula up to twenty calories per ounce.

I wish also to emphasize the point brought out by Dr. Blanton that the type of artificial feeding used is of less importance than attention to the other cardinal points of premature care. It has been definitely proven that forty to fifty calories per pound weight is sufficient in the great number of cases, and that we should never go beyond sixty calories per pound body weight.

I wish to re-emphasize the importance of giving vitamin C early, because the lack of this vitamin results in failure of the infant to utilize protein completely.

Let me emphasize that the success of saving premature infants depends largely upon the skill and judgment of the obstetrician. He should constantly keep in mind the dangers of trauma and anoxemia and should avoid the giving of morphine to the mother. He should also use the barbiturates sparingly. This cooperation with the pediatrician will give the premature a far better chance of living.

Dr. W. Ambrose McGee, Richmond, Va.—Perhaps some of you recently saw the type of infant equipment that the Cradle Institute of Evanston, Illinois, uses. It was shown at the last A.M.A. meeting in Cleveland. Of course, that was not just for prematures, but it was a splendid attempt completely to do away with infection. Each unit was completely air-conditioned.

I do not recall whether anything was said by Dr. Blanton about humidity, but I think it is generally

agreed that where the humidity is a little higher than usual and the temperature above 70, the results are better.

Feeding by gavage is a superior routine; more concentrated formulas can be given at greater intervals with less effort on the part of the premature.

Dr. Angus M. McBryde, Durham, N. C.—I have been taking care of prematures in the South for eleven years, and we have had on our service about 700 premature infants equally divided between negro and white infants, most of them born in the hospital.

There has been a great deal of stress put upon the question of keeping the child warm. I should like to take the opposite tack and suggest keeping the baby sufficiently cool. This is especially important for those of us who live in the warm South. We have not much difficulty in keeping the premature infant warm. Our main difficulty is in keeping him cool during the hot summer months, thus preventing diarrhea. So I would like, if possible, to add to the equipment which Dr. Blanton has outlined, at a cost of about $200, a small sum considering the results which can be accomplished. This equipment consists of some sort of refrigerating apparatus for a small premature nursery. This apparatus will keep the temperature during the summer months between 78 and 82°, which is about the optimum, and your radiators can keep it at the same temperature in the winter.

The refrigerating apparatus is absolutely essential in North Carolina, in the lowlands at least. Before our premature room was cooled in summer because of the heat or because of infection, I do not know which, diarrhea occurred in our infants each year. We have not had any epidemics of diarrhea in the premature room since it has been cooled.

I believe it is more practical to have some type of humidifying apparatus which will humidify the entire room at not too great an expense. This will make the high-priced incubators unnecessary; Dr. Blanton's plywood box is all one needs. One can get such a humidifying apparatus, with an automatic humidistat, which will keep the humidity at from 50 to 65 per cent. This humidifier will throw cold vapor into the air and will cut off automatically when the room humidity reaches 60 to 65 per cent.

The total outlay for all apparatus, so far as cost is concerned, will run under $300. Replacement will be unnecessary for seven to eight years. The upkeep is very low.

It may sound like heresy, but I do not believe breast milk is always the best food for the premature infant when two factors are considered: first, the concentration; second, the practicability of being able to get breast milk. Dr. Julius Hess has an ideal set-up in Chicago with large numbers of wet nurses. This is not practical in many situations. In our area the mother is our only source of breast milk. She leaves the hospital early and usually lives at a distance. The premature infant at birth, especially under 1,800 grams, is not a normal infant. Breast milk is certainly the best food for the normal infant, but one must concentrate it or feed concentrated cow's milk with sufficient carbohydrate added so that the caloric value is approximately one calorie per c. c. There is evidence to show that nitrogen retention is higher on half-skimmed milk.

As far as the method of feeding is concerned, I believe any infant that takes more than twenty minutes to take his feeding ought to be gavaged. If he takes forty or sixty minutes every two to three hours, gets strangled and turns blue, he is probably using more energy swallowing than he gets from the formula given him. The danger of aspiration pneumonia also is greater when the weak premature infant is not gavaged.

In our premature room we gavage the infants until they are ready for the nipple. Gavage by a competent nurse takes about two minutes, while it takes twenty to thirty minutes to feed the premature infant. You can thus take efficient care of more infants with the same number of nurses.

I think the one thing of most importance that Dr. Blanton stressed was the question of having some one in the small hospital who is premature-minded and a nurse who is willing and able to take care of premature infants.

Dr. Arthur G. Quinn, Memphis, Tenn.—Our hospital has about 275 prematures a year, and we have a very good nursery. But the things we have learned in the last few years about the care of the premature, it seems to me, can be carried out in many places.

There are two important things to keep in mind. Heat, or maintenance of body temperature, is the first thing that lowered the premature mortality. There are various ways of providing this. We used the box with canvas sides, with light globes, until we found that the best way to do was to wrap the baby in a blanket and keep the blanket warm to hold his own body heat. In that way the humidity takes care of itself. That procedure can be carried out anywhere if there is an electric light connection. For instance, an ordinary gooseneck light put down over the blanket will keep it warm. That is one thing.

No matter how much equipment you have or what kind of equipment, it is the trained personnel that saves premature babies.

There seems to be quite a difference of opinion as to what to feed the babies. We have had diarrheas under all circumstances. Fortunately, we are able to give breast milk. We do not expect to lose infants weighing over four pounds, and we send them home just as we do the infant that weighs more. When they drop under three and one-half pounds, as Dr. McBryde says, you are running into trouble.

They speak of so many calories. We do not try to raise the baby's weight. We hold the weight stationary. We give small amounts of food. In a few cases we use gavage. It was our unfortunate experience to have a tube pushed through a premature baby's stomach. That will happen if you keep it up, unless you have someone on duty twenty-four hours a day who knows just how to put it in.

In giving food to hold the weight stationary, the activity or the growth and development of the baby will demand more food, and we increase it. We do not have diarrheas in that way. We can get a diarrhea on breast milk, or anything else, if we overfeed the baby. I have never seen a premature or a newborn hurt or starved from underfeeding.

Dr. Blanton (closing).—Dr. Moore indicated that we should give vitamin K to the mothers. It is routine at our hospital to give every mother admitted to the obstetrical department vitamin K either by mouth when she comes in and goes into labor, or if labor is already

established vitamin K is given hypodermically in 5 milligram doses approximately four hours before birth. Then the baby also gets a dose of vitamin K, whether it is a premature or full-term baby, immediately after birth.

I have not felt that intramuscular blood was needed. In fact, premature tissue is so delicate that I rather question the procedure of sticking blood into these babies by this method. If blood is indicated, it should be given intravenously.

The thing we have tried to work toward in our initial premature care was the fluid requirement, and we have been rather successful in taking care of this by mouth. By using breast milk, we have avoided any upset in the baby's digestion until we reach the fluid intake of two to three ounces per pound of body weight. After that problem is taken care of, then we build up the concentration of the breast milk to a point where the baby will gain, and by doing that cautiously we avoid any digestive upsets.

Dr. McGee mentioned humidity. We take care of humidity in this premature box very simply, and it can be very adequately controlled by the use of lights over the pan of water and by the use of paper towels. If there is any difficulty in keeping the humidity up, use a folded towel under each light; we usually use three lights, which will give greater liberation of moisture. We have had no difficulty in keeping the humidity up to the proper level.

In our climate we do not have to worry about keeping these babies cool, because we are in a mountainous section. I do not know how well this same box would work if we put cold water or even ice water in this pan at the entrance of the air intake.

Dr. McBryde also mentioned the humidity apparatus for the premature room. That is very ideal, but there are very few small hospitals that can spend $300 for this equipment. The other fact is that there may be weeks at a time when we have no premature to be treated. We can control the humidity fairly satisfactorily in this cheap type of box. This equipment runs about $12 in all for the control of heat and humidity.

Dr. Quinn mentioned the gavage technic. We always impress upon the nurses the danger of putting the tube down too far. In fact, we tell them if they are sure they are well into the esophagus that is sufficient; that it really is not necessary to have the tube all the way into the stomach.

I realize the number of cases we have reported is entirely too small to draw any definite conclusions. It does, however, indicate a trend in improved supervision for premature infants.

Again, I want to stress that the avoidance of upsets of all kinds is essential in good premature care.

The national program for premature care is not separate from the maternal and infant welfare program of the Children's Bureau. It is a very integral part of that program, however, and numerous attempts in different states have been made to solve this problem. I think Massachusetts is the only state that is actually using general hospitals as premature centers, and they are using only about one-third of their general hospitals scattered over the State, forty-eight hospitals, or premature centers, scattered over Massachusetts, which has a total of about 150 general hospitals.

The fact that the premature rate is decreasing in these centers shows that we are definitely on the right track, and the fact that this type of care can be provided cheaply in general hospitals should stimulate us to further efforts along that line. Twenty-five per cent of all deliveries in the rural areas are still in the home, and yet this trend is changing considerably, as shown in our statistics, where the number of admissions to our hospital doubled in the last five years. We must be prepared to take care of these babies, whether they are born in the hospital or are sent to the hospital from the home where inadequate care necessarily has to follow.

I think when these principles are carried out in the smaller hospitals we will see a very definite reduction in mortality.

THE TREATMENT OF VINCENT'S INFECTION WITH FUADIN*

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This subject will be presented briefly here in these subdivisions: definition of the condition, description of the organism, its clinical aspects, general principles in treatment and specific therapy.

Vincent's infection or Vincent's disease[1] is an acute or chronic inflammation of a mucous membrane due to Vincent's spirochetes and fusiform bacilli. This definition does not indicate whether or not these organisms are of primary etiologic importance or whether they are secondary invaders. It has been said[2] that these organisms are "opportunists" and are not primary pathogens. Strictly speaking, of course, there is a basic background making for susceptibility in all infectious diseases. When the Vincent's organisms do gain a foothold, they may produce both superficial inflammation and deeper destructive lesions. The organisms are found in the advancing periphery of these lesions. This infection may involve mucous membranes of the mouth (gums, cheeks, tongue), tonsils, nasal cavity, pharynx, esophagus, larynx, bronchi, intestinal tract, genitalia and perineum. Rarely it may be found in ulcerative or necrotic lesions of the general skin surface. It apparently is occasionally distributed by the blood stream to internal structures. It is seen most frequently

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in the mouth and nasopharynx. Following the more superficial inflammation there is a tendency for the organism to produce necrotic ulceration and a pseudo-membrane. There is usually an associated disagreeable odor and discomfort. The ulcers are well defined with a punched-out appearance and undermined border. It may be confused with diphtheria, syphilis, agranulocytosis, avitaminosis, pyorrhea, and other affections. These latter conditions should be considered and appropriate clinical and laboratory investigations instituted in all cases where the Vincent's organism are present. Likewise, proper therapy and management should be adopted if any of these similar or associated conditions are present.

The Vincent's organisms (T. vincentii and B. fusiformis) are easily demonstrated in this condition. When these organisms are not present in a properly prepared and stained direct smear, this infection can be discarded in a particular case. Smears from superficial lesions and from superficial portions of the deeper lesions may show a predominance of the bacilli. The spiral organisms are more abundant relatively in the deeper proportions of the lesions. The spirals can be seen in the tissue beneath the necrotic focus. The fusiform bacilli are 0.5 to 0.8 micron in thickness, and the length varies from 3 to 10 micron, they taper to the ends and may be either blunt or sharp, they may occur in chains, do not stain easily and are usually gram-negative. The staining of the body is irregular in intensity. The more penetrating stains like Loeffler's methylene blue and carbolfuchsin should be applied to the smear from four to six minutes. The bacillus is usually reported as being nonmotile in darkfield preparations. The spirilla in this condition are longer, are actively motile, and show shallow and variable waves. These spirals also do not stain easily but are regular.

It is best to remove the superficial exudate or membrane and prepare a smear from the deeper exudate. The organisms are cultured with difficulty under anaerobic environment with special medium. It has been reported[3] that pure cultures of the bacilli will show spirals after about a week. This is quoted as indicating that these organisms are the same, but in different stages of development. Other authorities say that they are two separate and distinct micro-organisms and live in symbiosis. It is also claimed by some that these bacilli and spirals live and multiply only in association with other organisms (cocci, vibrios, etc.) The diagnosis of Vincent's infection should not be made without the presence of organisms with the above characteristics.

Vincent's infection of the mouth is probably more prevalent than any other type. Chronic ulcerative gingivitis occurs frequently. Smears from underneath the gum margins show many cigar-shaped bacilli and spirals. It is unnecessary to debate the question as to whether or not these organisms are primary or secondary invaders. All will admit that this condition is usually associated with some other abnormality like mild scurvy, other types of avitaminosis, chemical stomatitis, malocclusion of teeth, or other dental abnormalities, blood dyscrasias, and/or disturbances in many other tissues and viscera of the body. Eradication of this invader, whether a saprophyte or primary pathogen, along with the correction of the associated abnormalities would seem to be the logical procedure. The proper management of early and mild chronic Vincent's gingivitis will prevent much of the advanced type of pyorrhea and receding gums.

The more acute inflammatory and ulcerative condition in the mouth and nasopharynx is characterized by pain, membrane formation, difficulty in eating and swallowing, malaise and fever. The surface may be tender and bleeding with swelling of the adjacent lymph nodes. There is salivation and disagreeable odor.

As previously mentioned, this condition may involve other portions of the body, namely: nasal cavity, middle ear, larynx, trachea, bronchi, bronchiectatic cavities, alimentary tract, conjunctivae, general skin surface, and genitalia. The clinical picture is somewhat similar to that described involving the mucous membrane of the mouth, and the methods of demonstrating the organism are the same, except for the difference in obtaining the specimens. The latter will vary, of course, with the anatomical part involved.

In Vincent's infection about the mouth all dental anomalies such as tags of tissue, crusts on the teeth, rough margins, loose fillings and cavities should be given immediate but gentle attention. Since the organism is an anaerobe, the application of an oxidizing agent is helpful. This should be followed by an antiseptic. This can be done very effectively by spraying with a nozzle applicator and fairly high pressure, using one-half strength hydrogen peroxide. Each

tooth should be treated individually. The physical removal of the exudate and debris in this way and the force around the gum margins allows the oxidizing agent to reach the areas of anaerobic environment. The mouth should be gone over twice in this way at each visit. Then, after the patient has washed the mouth with a weak solution, a mild penetrating antiseptic like 1 per cent aqueous solution of mercurochrome can be used as a spray in the same way. In the acute cases this procedure can be repeated two or three times daily. The use of tooth brushes with hard bristles should be avoided. Parenthetically it might be added here that the proper use of the old-fashioned toothpick is beneficial. When Vincent's infection occurs in other parts of the body, the same principles of cleanliness, eliminating anaerobic environment and irrigation with oxidizing agents are applicable. Encrustations on the teeth require the attention of a dentist.

Later, after this infection has subsided or disappeared, dental abnormalities should, of course, be permanently corrected. A cavity in a tooth may be the focus from which reinfection begins.

All patients are given advice in regard to a balanced menu to include adequate proteins and vitamins, and in addition every case is given 25-50 mg. of cevitamic acid three times a day. It is better to give this several times a day than to take it all at one time because certain individuals eliminate vitamin C from the body so rapidly that they have a deficiency part of the twenty-four hours if all of this is taken at one time. The environment produced by the tissue changes caused by definite or subclinical scurvy is suitable for the growth of Vincent's organisms. In the acute cases excessive smoking is harmful.

The arsphenamines and antimony and potassium tartrate (tartar emetic) intravenously have been used in fuso-spirochetal infections for a number of years. The danger of severe untoward reactions following an arsphenamine seems to be higher in this infection. This is illustrated by a report before this Association a few years ago of a case of arsenical encephalitis with death following two injections of an arsphenamine for "trench mouth."[4] The immediate reactions following tartar emetic intravenously may be very annoying and occasionally serious reactions may occur.

In 1933, Williamson *et al.*[5] introduced a new antimony compound for the treatment of granuloma inguinale. This substance is called fuadin (sodium antimony III biscatecholdisulfonate of sodium). It contains 13.6 per cent of trivalent antimony. It is dispensed in a 6.3 per cent aqueous solution.

This compound was first produced in Egypt in the treatment of bilharziasis. After its introduction into this country, it soon replaced tartar emetic in the treatment of granuloma inguinale. Shortly after this we began using this substance in our clinic in the treatment of Vincent's infection of all types. The toxicity was tested out in animals and this was found to be very low. In addition, it was very effective in the treatment of trypanosomiasis in animals. It is given in 5 c. c. doses of the 6.3 per cent solution intramuscularly at daily intervals.* There is very little local reaction and there has been only an occasional untoward systemic effect. In a few instances patients have complained of pain about the joints resembling those of a bursitis.

Fuadin is reported as being an effective remedy for heartworm in dogs. For this it is supplied in 30 c. c. rubber-stoppered bottles and this is the same solution supplied in glass ampules for human consumption.

The clinical manifestations of Vincent's infection disappear promptly following its use and the curative effect is more complete and permanent than after the use of other drugs. In the average case six injections are required, but in the more obstinate 12-15 injections may be necessary. The first six injections are given daily, then they are given every other day. Vincent's organisms usually disappear promptly from the lesions. This drug has been used in both adults and children. It has been reported by Purcell[6] as being efficacious and free from untoward reactions in pediatric practice.

It should be re-emphasized that all other predisposing and associated causative factors in an individual case should be corrected.

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*Supplied by the Winthrop Chemical Company.

DISCUSSION (*Abstract*)

Dr. M. T. Van Studdiford, New Orleans, La.—Vincent's is a disease that depends upon devitalized tissues for a medium. Therefore, I have always considered it a saprophyte, which grows in the mouth because there is a culture medium there and there is a reason for it. If you will look back and read different articles on burning tongue, some of these articles will more or less lead you to the opinion that there is something down in the intestinal tract causing the burning tongue. So also with Vincent's, some debility or faulty action of the individual prepares the tissue for the growth of the Vincent's organisms.

Acute Vincent's is another type of the infection and can be found very often in a group of young "jitterbugs" after a big party or dance. This type gets well of its own accord in a few days.

It is always my practice in the office, along with cleaning up the mouth, to try to find a causative condition further down in the intestinal tract or a lack of normal secretions of the intestinal tract that may be giving the trouble up in the mouth. One should give a transfusion, oxgall in capsules, gentle cleaning of the teeth, and then, when the attack has abated, good dental prophylaxis. A complete blood picture should be made in order not to overlook leukemia.

I have never used fuadin as the heavy metal of choice, but instead have used soluble bismuth injections. However, as the author has shown, fuadin also accomplished good results.

Dr. Richard S. Weiss, St. Louis, Mo.—There is some danger in using the arsphenamines in cases of this kind. From Dr. Smith's report it would seem to me that there is very little danger in using fuadin. What little experience I have had with it in other diseases seems to confirm this. The first impulse of anyone who gets a case in which he finds fusospirillosis of the mouth is to shoot the patient full of neoarsphenamine and to paint the mouth with neoarsphenamine solution. The tendency is to give arsphenamine every three or four days, and there is no doubt that it usually cures the disease.

But I have seen three cases of arsphenamine eruptions due to the treatment of fusospirillosis by injudicious use of large doses of neoarsphenamine frequently injected intravenously. So I think we should be grateful to Dr. Smith for giving us this newer treatment which his report indicates is far less toxic and far less liable to produce untoward results.

Dr. Smith (*closing*).—When this paper was started, I hoped to be able to review the records in our clinic and hospital and include details about how long it took the spirochetes to disappear, and so on, but the records were not adequate in this respect.

It is true that the organisms disappear promptly from clinical observation. We have all seen cases of Vincent's improve rapidly following arsphenamine, but they are not completely cured. With fuadin, there seems to be complete cure if the other associated conditions are also treated.

A comment should be made about the presence of Vincent's spirals and bacilli on apparently normal mucous membrane. A patient has a burning tongue, you make a smear and find some Vincent's organisms; this does not mean that the burning tongue is due to these organisms. There are cases in which you have an actual pathologic process produced by these organisms. Whether they are saprophytic or primary pathogens is not basically important. We have to have a susceptibility for the pneumococcus, for example, to get pneumonia. One of the requirements for the development of this organism for it to get any foothold in the body is the death or near death of the tissue, and they grow best in the environment of exudates.

SULFANILYLGUANIDINE IN THE TREATMENT OF ENTERIC INFECTIONS*

By J. Gilbert Eblen, M.D.
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Sulfanilylguanidine (sulfaguanidine) is the guanidine analogue of sulfapyridine and sulfathiazole. This drug is water-soluble, experimentally active against bacteria and poorly absorbed from the intestinal tract, producing a low blood and tissue concentration and a high intestinal concentration. It exhibits an ability to interfere with the metabolism of bacteria in such a way as to prevent their multiplication in much the same manner as the other sulfonamides. Because sulfaguanidine is poorly absorbed from the intestinal tract and is bacteriostatic against many of the bacteria which occur in the intestinal tract, it appears that the drug has some use in the treatment of bacillary dysentery and in the prevention of infection in surgery of the colon.

Marshall[1] and his co-workers in seventeen cases of acute bacillary dysentery reported that sulfaguanidine was an effective therapeutic agent, especially if given early in the disease, and recommended a further trial. Lyon[2] treated twenty-three cases of severe or relatively severe acute bacillary dysentery and reported the drug to be effective and most effective when given within the first three or four days of the diarrheal state. Five cases seemed to be uninfluenced by the drug. The cases receiving sulfaguanidine were generally improved clinically in 24-48 hours with a reduction in temperature, number of stools and a rapid disappearance of pus and blood from the stool. Among the twenty-three controls, only one patient had the diarrhea checked before the sixth day and there was a continuance of bloody diarrhea, cramps, nausea, vomiting and temperature into the sec-

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*From the Knoxville General Hospital.

ond and third weeks. Few[3] toxic effects have been observed in the treatment of patients with sulfaguanidine and those occurring have been of the same nature as observed with other sulfonamide drugs.

Taylor[4] has reported good results in the treatment of thirteen patients admitted to Duke Hospital because of bacillary dysentery or parenteral diarrhea with sulfathiazole. The average time for stools to become four a day and of normal consistency and color was 3.2 days in the sulfathiazole group and 15.6 days in the control group. He concludes that sulfathiazole is effective in the treatment of children with parenteral diarrhea or bacillary dysentery, particularly the latter. Anderson,[5] in a review of infectious diarrhea at the Henrietta Egleston Hospital for Children, reported 39 deaths in 113 cases from 1930 to 1939 and no deaths in 17 cases treated with sulfathiazole in 1940. In the same period in so-called non-infectious diarrhea there were no deaths among 16 cases treated with sulfathiazole, while from 1930 to 1939 there were 15 deaths out of 111 cases.

Excluding the neonatal period, bacillary dysentery and the large group classified as diarrhea and enteritis, together is the largest single cause of death from two weeks to two years of age. This is true internationally as well as in our local community. Ravenel and Smith[6] have estimated that about 20,000 cases of bacillary dysentery occur annually in eleven Southeastern states.

Our problem at the Knoxville General Hospital, I am sure, is common to many medium sized Southern cities, with a city hospital that is usually surgically minded, with rotating interns, crowded quarters, understaffed with nurses and a clientele that is ofttimes suffering from undernutrition, deficiency diseases and repeated purgation. In previous years in spite of following the usual accepted pattern of treatment there had been slow progress.

In view of the fact we had recommended to us two chemotherapeutic drugs that were effective in the treatment of bacillary dysentery, one of which was also recommended in the treatment of parenteral diarrhea, we decided to use sulfaguanidine on all number one's, sulfathiazole on all number two's and no chemotherapy on all number three's, of all diarrheas admitted to the Knoxville General Hospital regardless of the type of diarrhea encountered. The diarrheas were classified, but the patients were to be placed in their respective groups according to admission rather than according to the type of diarrhea. All patients were treated alike except for chemotherapy. The routine followed for all patients was: (1) correction of acidosis if present; (2) 5 per cent dextrose intravenously when indicated; (3) parenteral fluids; (4) after hydration blood transfusion if indicated; (5) nothing by mouth for the first twenty-four hours except Ringer's solution, weak tea and water; (6) an evaporated lactic acid formula with added casec and buttermilk for the older children; (7) solid food was given early in liberal quantities and tolerated well.

The dosage of sulfaguanidine used was 0.1 gram per kilogram as the initial dose, then 0.05 gram per kilogram every four hours as a maintenance dose until the stools become five or less per day and then the dosage was reduced to 0.05 gram per kilogram every eight hours and continued for 48 to 72 hours. This approximates 2.5 grains per pound per 24 hours, reducing to 1 grain per pound per 24 hours when the stools improve. The sulfathiazole group was given 1.5 grains per pound of body weight for 24 to 48 hours and then reduced to 1 grain per pound per 24 hours as a maintenance dose.

Obviously in a study of this type there is a certain amount of case elimination to be done due to errors in diagnosis, extremely late cases, previous chemotherapy before hospital admission, moribund cases and control cases which get out of hand. With these eliminations the cases as a group were fairly comparable in age, severity, intoxication and duration of disease before admission, except that all desperately ill children were given chemotherapy. We did not feel justified in withholding a therapeutic agent that was indicated from a desperately sick child.

Carwin[7] has demonstrated that bacterial counts of stools obtained from animals taking sulfaguanidine show that it does not cause a reduction in the total number of organisms in the stool, but that there is a marked suppression of gram-negative bacilli and concomitant increase in gram-positive cocci. Levi and Willen[8] report the successful eradication of typhoid bacilli from a carrier with sulfaguanidine. It occurred to us that sulfaguanidine might be of value in the treatment of typhoid fever and we have used it in nine cases, the results of which will be shown.

Comment.—While seeing this group of bacillary dysenteries we somehow got the opinion that sulfaguanidine was more effective when

given early in the disease and that in cases seen late sulfathiazole was more effective. In complete failure one is certainly justified in changing drugs. Blood sulfaguanidine levels varied more with the same dosage than has been our experience with other sulfonamides. We have no explanation for the complete failure of sulfaguanidine to alter the course of typhoid fever.

CONCLUSIONS

(1) Sulfaguanidine is effective in the treatment of acute bacillary dysentery in children, being only slightly superior to sulfathiazole, especially if given early in the disease.

(2) Sulfaguanidine is ineffective in the treatment of parenteral diarrhea. Sulfathiazole is effective.

(3) Sulfaguanidine does not affect the course of typhoid fever.

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DISCUSSION (*Abstract*)

Dr. George M. Lyon, Huntington, W. Va.—Assuming that both sulfanilylguanidine and sulfathiazole are efficacious in treating acute bacillary dysentery, I think there is rather general agreement that sulfathiazole is significantly more liable to cause toxic reactions when so used. Because of this, and because of the freedom from such reactions in the case of sulfanilylguanidine, probably sulfanilylguanidine should be used in preference to sulfathiazole. This is particularly true where one has to treat many patients in their homes or in a semi-ambulatory way as we are forced to do in the mining districts. We have felt that it was not safe to give sulfathiazole to patients in outpatient services, or even in homes, who are not being rather closely watched, a condition practically impossible in many forms of industrial and rural practice.

On the other hand, we have shown amply that one can do this with sulfanilylguanidine with complete safety.

In the outpatient department of the Huntington Baby Clinic, Drs. Folsom and Parsons have treated more than 80 youngsters under school age with sulfanilylguanidine in this manner. They gave the dose recommended every four hours for three days, and at the end of that time if the diarrhea had not cleared up properly they were given some more of the chemical. Only six children required any after the first three days. No evidences of toxic reaction were observed.

As far as its use in the mining fields is concerned, it has been shown that sulfanilylguanidine can be used in general practice with complete safety. It has also been shown that it is highly effective in the treatment of acute bacillary dysentery, "bloody flux," as it is known locally.

It is the rather empirical impression of most of the observers I have talked to from those districts where they have more of this disease than we have at home, that it takes sulfathiazole from one to perhaps two days longer to clear up the stools and to produce clinical cure than it does sulfanilylguanidine. This is my impression. The facts that sulfanilylguanidine is free from toxic effects in youngsters, and that it is effective in a short period of time, seem to me to make it without question the ideal drug for this purpose at the present time.

We had an interesting experience with sulfathiazole in a child who was in the hospital for an orthopedic condition, a pyogenic affair. While on sulfathiazole medication in more than the required dosage, the child became infected with Flexner bacilli from other patients in the hospital, a typical hospital cross-infection. The infection yielded to sulfanilylguanidine, but not so promptly as usual.

In New York State an epidemic of bacillary dysentery occurred in an institution. It was of the Flexner type. Sulfanilylguanidine was without effect on this strain. Such instances of successful resistance of an individual strain against the chemotherapeutic agent employed has, however, been encountered from time to time in the use of other sulfonamides, already known to be highly valuable and effective therapeutic agents.

Dr. Clark H. Hall, Oklahoma City, Okla.—We have a state-wide service and we do not get our patients so early as they are seen in a municipal institution. We have found that sulfanilylguanidine is effective in more cases of dysentery than sulfathiazole. Our series is not large enough yet to say just how much more effective.

The effect, when it does take place, is dramatic, as Dr. Eblen has already mentioned. The temperature is lowered, the general condition improved, and the bowel movements return to normal.

We have each year a group of chronic or subacute, more of the chronic, cases of diarrhea that have been treated over the state for quite some time, and among them we have had very little help from sulfanilylguanidine. We have had more help here from sulfathiazole. Even in these, we are not impressed with the help we have had.

There are a number of things that influence these factors. One is the fact that the patients are often poor risks. We get them late, and they are generally below the average encountered in an acute hospital like a city hospital.

Fortunately, we have very little typhoid and we cannot express ourselves yet as to the use of sulfanilylguanidine in this condition.

There is one thing I want to emphasize in the use of chemotherapy, and that is, do not forget the patient. Because he is getting these so-called specific drugs, we often lose sight of the fact that he needs proper fluids, blood transfusions and general treatment.

Dr. Eblen (closing).—We have no trouble getting our

interns to give chemotherapy. They will give chemicals to anyone who comes in, but the difficulty is that sometimes they have trouble classifying their diarrheas. We have been trying to find which chemotherapeutic agent to tell them to use regardless of the type of diarrhea encountered. When a patient comes into the outpatient department at night and is not quite sick enough to come into the hospital, we want to tell the interns what drug to give the patient, and to have him come back to the clinic the next day.

I believe Dr. Marshall's original idea was to saturate the stool with the chemical. In treating these patients, it might be better if we should attempt to determine the sulfanilylguanidine in the stool and perhaps not pay much attention to the blood level, because we want the drug localized in the intestinal tract.

In addition to these groups, we have a lot of nonspecific diarrheas, and we are not prepared to make any statement about them at the present time.

I want to emphasize again what Dr. Hall and Dr. Lyon have said, that chemotherapy is no substitute for fluids and other measures which have been successful in reducing the mortality from diarrhea.

AN UNCLASSIFIED TYPE OF ULCERATIVE DISEASE OF THE COLON*

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LOUIS A. BUIE, M.D.
and
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Ulcerative disease of the gastro-intestinal tract continues to be one of the outstanding enigmas in medicine. Gradually experience has established the etiology of such diseases as amebiasis, tuberculosis and bacillary dysentery, but the etiology of the large group which includes peptic ulcer, regional enteritis and various forms of ulcerative disease of the colon continues to be a challenge to us.

In our studies of the past few years we have been puzzled by a group of peculiar cases of colitis which are not idiopathic or thrombo-ulcerative colitis nor the usual specific types, such as amebic, tuberculous and bacillary colitis, and so forth.

The term "colitis scrap basket" has come into use during years of experience because we have encountered instances in which classification of certain inflammatory diseases of the colon has been impossible. As the number of these records has increased we have striven to learn more about the nature of the disease which they represent, always hoping that the identity of one or more classifiable conditions could be established. The three of us have jointly reviewed and agreed on each case of the group of forty-one cases which we are considering and in which we have designated the condition as an unclassified type of ulcerative colitis. It is of further interest that, not only we but our colleagues in this work agree that we were dealing with a peculiar condition. This paper is not a clinical review, but rather is a discussion of problems that are puzzling to us and which we hope will stimulate the interest of all physicians. We are still uncertain as to the significance of this group and realize that it may be an artificial selection. Patients who have had ulcerative disease of this type have come to us with the diagnosis of sprue, pellagra, pernicious anemia, tuberculosis and even carcinoma. We recall a group of cases in which the condition formerly was diagnosed as either ileotuberculosis or ulcerative colitis of the right half of the colon with retrogression into the ileum. Now it is common knowledge that the majority of such patients have regional enteritis with extension into the colon. Possibly we may segregate other instances from the "colitis scrap basket" just as has been done with regional enteritis of the terminal portion of the ileum. In any event, the more constructive observations, either clinical or investigative, that are offered in the experiments with ulcerative disease of the intestine, the better are the prospects for care of patients with this wretched trouble.

Before proceeding further, we shall consider these unusual changes which prompt the proctologist and roentgenologist to identify this type of ulcerative disease of the bowel.

PROCTOSCOPIC ASPECTS OF THE PROBLEM

When, on proctoscopic examination, we encounter one of these bizarre types of colitis it does not take long to recognize it. This is not because the picture of an easily diagnosable distortion of the mucosa of the terminal part of the colon is clear-cut. It may appear in some respects like one or more of the diseases that we are able to diagnose and yet not enough like any one of them to bear its name. To one who is familiar with the varied proctoscopic picture of this unclassifiable group, the gross appearance of the interior of the bowel might be considered

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*From the Division of Medicine and Section on Proctology and Roentgenology of the Mayo Clinic.

almost "typical." Yet, paradoxical though it may sound, the chief characteristic of the picture is its uncharacteristic appearance. In some respects we study the diseased mucosa much as an inspector who grades commodities like tobacco, coffee or leather studies them. The diagnosable diseases may be compared to the various grades of the products and when we find that an inflammatory disease of the colon fails to fit any known type of the disease, we toss it into the "colitis scrap basket" much as ungradable coffee, leather or tobacco are thrown into a scrap heap for further consideration. It is important that we know the proctoscopic picture of the diagnosable groups. For this reason and owing to our inability to offer a well-defined description of the gross pathologic appearance of the unclassifiable types, we offer the following summary of the characteristics of some of the "gradable" diseases.

Thrombo-ulcerative Colitis.—To many physicians this disease is known as idiopathic ulcerative colitis or merely as chronic ulcerative colitis. There should be no confusion in distinguishing it from the unclassifiable lesions because no disease of the colon presents more characteristic proctoscopic features than thrombo-ulcerative colitis. In proctoscopic reports in cases of thrombo-ulcerative colitis the words granular, bleeding, glazed, scarred, moth-eaten appearance, rounded valve margins, contracted lumen, and pocklike scars are used frequently in describing the wall of the bowel. Many times, more than one or even most of these terms are used in one report. We have not observed such a characteristic appearance of the wall of the bowel in our study of the cases in this series.

Amebic Dysentery.—On proctoscopic examination, ulcers are found in a bowel which is free from other evidences of disease. These ulcers are oval or rounded and have clear-cut, elevated margins and bases. The latter, however, when relieved of their "white caps," lie below the levels of the margins. This arrangement gives to the ulcer a punched-out or umbilicated appearance which truly identifies it as an amebic ulcer.

Bacillary Dysentery.—If the appearances of tuberculosis of the colon, thrombo-ulcerative colitis, amebic colitis and malignant lesions are kept in mind, it is easier to identify this form of dysentery. In this condition, there is no point in the wall of the intestine where the mucosa will be free from evidence of inflammation. There is widespread hyperemia together with spotted, hemorrhagic tissue and edema of the mucous membrane. Ulcers with margins which are leveled down and adherent to an angry red base may be present. The margin of the ulcer is not undermined and there is a scattered patchy arrangement of a reddish gray membrane which may sometimes coalesce and cover large portions of the mucosa. In acute cases the wall of the bowel is thickened greatly and the mucosa may be covered by a dense, white, fibrinous membrane which is interrupted by serpiginous ulcers of variable size that possess irregular margins. In the chronic forms of the disease shallow, flat, sharp-edged ulcers of many shapes and sizes lie in a membrane which is scarred patchily and contracted irregularly.

Ulcerative Rectal Tuberculosis.—The morphologic characteristics of these ulcers should be confused only with those caused by *Endamoeba histolytica.* The lesions appear in an irregularly circular, oval or elliptical shape with grayish yellow caseous bases, the surfaces of which reach almost to the level of the mucosal lining of the rectum. The edges do not appear to overhang the bases, but in reality they do and this can be demonstrated by inserting a probe beneath the free edge of the disintegrated aperture. The ulcer is larger and the margins as smooth and even as those of amebic dysentery. The bases are more adherent.

Balantidium Coli.—Usually, the ulcers measure 1 cm. or more in diameter and resemble those seen in amebic dysentery. The wall of the bowel between the ulcers presents the same uninvolved appearance. The discovery of the parasite, which is the largest protozoon living in the intestine of man, prevents complete confusion. This organism is from 60 to 70 microns long and 50 to 70 microns broad and the cysts, which are round or oval, vary from 50 to 60 microns in diameter.

Polypoid Disease, Carcinoma, Lymphosarcoma and Lymphopathia Venereum.—Polypoid disease and carcinoma of the terminal portion of the colon need no description, although lymphosarcoma must be watched for; this last, however, occurs rarely and examination of a specimen will reveal its identity. Lymphopathia venerea, gonorrhea and syphilis are susceptible to accurate diagnosis even if the proctoscopic examination does not always disclose the nature of the condition.

Unclassified Group.—In this group a describable proctoscopic picture cannot be expected and is not found. In order further to clarify the issue, the proctoscopic findings and reports in six of these cases will be considered in detail and comments made concerning the roentgenologic and clinical findings in the same case.

Case 1.—On proctoscopic examination the mucosa of the bowel was found thrown into irregular folds, especially in the lower part of the rectum and in the sigmoid. In between there was none of this characteristic change. In some places the mucosa was scarred irregularly. High in the sigmoid, mucosal tags were found which appeared to follow healing of irregular types of ulcers. In the middle part of the rectum were several ulcers 3 to 5 mm. in diameter which did not bear any distinguishing characteristics. Bleeding occurred on slightest trauma and there was no contraction of the bowel lumen.

In this case all studies of the stools failed to identify the condition. Roentgenographic studies of the colon revealed extensive but unidentifiable disease of the colon.

Case 2.—The picture on proctoscopic examination was that of a healing inflammatory process with extensive scarring and slight contraction. The disease was more active in the sigmoid than elsewhere. Specimens were removed and cultures taken, neither of which provided any significant information. Within the diseased portion were small islands of normal or relatively uninvolved mucosa surrounded by bands of scar tissue.

Examination of the stools in this case provided no clue to the condition, and the roentgenogram of the colon pictured diffuse involvement of the entire colon which could not be identified.

Case 3.—Proctoscopic examination disclosed an unusual type of inflammatory process which involved the anterior and right walls of the rectum. When slight pressure was made against the wall of the bowel, pus oozed from small openings in the mucosa. In the sigmoid there was a similar condition.

Roentgenograms of the colon revealed marked disease of the colon which was most marked distal to the hepatic flexure. Bacteriologic and cultural studies of the stools did not help. The clinician had to make a diagnosis of indeterminate type of severe colitis.

Case 4.—Discrete ulcers were found scattered throughout the rectum and sigmoid by the proctologist. There was also some scarring of the wall of the bowel, but practically no contraction. The ulcers were irregular in shape and size and the margins were not elevated. The condition was not like chronic ulcerative colitis. Cultures were taken. The proctologist concluded his report by suggesting a check for bacillary disease and *Endamoeba histolytica.*

Roentgenograms of the colon revealed diffuse ulcerative disease involving the colon distal to and including the hepatic flexure, but the nature of the disease could not be determined.

Case 5.—On proctologic examination several large deep ulcers extending in the direction of the longitudinal axis of the bowel, and much scar tissue, were found. The lumen was narrowed, especially in the lower portion of the sigmoid, but there was no distinguishing characteristic of the disease. The proctologist reported having seen such a condition in a case in which cholecystectomy had been performed recently. In that case the bowel was edematous also and the ulcers appeared more like splits. He stated that another patient who had exfoliative dermatitis had presented a similar condition following an injection of arsphenamine.

No tests proved helpful. Roentgenograms of the colon revealed total involvement, but did not offer a clue to the identity of the disease.

Case 6.—The proctologist reported that the mucous membrane was thrown into edematous folds and there was a combination of ulceration and diffuse inflammation which is not characteristic of any particular disease. One long ulcer was seen on the anterior wall in the middle third of the rectum which was suggestive of tuberculosis. The chief characteristic of the disease was that its appearance was not specific.

Here again nothing could be found from any source which would aid in establishing the diagnosis.

Final Comment on the Proctoscopic Aspect of the Problem.—We have observed that usually the proctologic findings and reports are confusing in these cases. When these reports are concluded by noting similarity to tuberculosis and amebic dysentery, asking about stool tests, cultures and roentgenologic reports, suggesting some toxic or dietetic influence and finally admitting that the picture is irregular, it is probable and almost certain that it is the unclassifiable type of colitis.

ROENTGENOLOGIC ASPECTS OF THE PROBLEM

The roentgenologic manifestations of all forms of ulcerative colitis reflect the gross morphologic changes which the pathologic process produces in the size, shape and general contour of the part of the intestine affected. Pathologic changes of roentgenologic significance are (1) general contraction which implies narrowing of the lumen and foreshortening of the affected portion of bowel, (2) productive and destructive changes in the intestinal wall, (3) diminished flexibility and mobility and (4) destructive changes in the intestinal mucous membrane. These changes are, however, essentially the same whatever the cause of the disease may be. To distinguish the various etiologic types of ulcerative colitis from each other, the roentgenologic examiner uses such roentgenologically recognizable features as the site of earliest and severest involvement, the distribution of the pathologic process in the intestine, its method and direction of extension, the general intensity of the pathologic changes, and significant roentgenologic findings in other organs which might give a clue to the nature of the disease.

Idiopathic or thrombo-ulcerative colitis and

the amebic and tuberculous forms of ulcerative colitis have consistent roentgenologic manifestations, and it may be said that most other forms of ulcerative colitis are diagnosed roentgenologically chiefly by noting how they differ in their roentgenologic manifestations from these more familiar etiologic types. Review of the roentgenologic findings in the cases under consideration in this paper leaves the impression that no single description can be made to fit all of them. In some, hyperplastic or productive elements seemed to predominate in the roentgenologic picture, in others ulcerative or destructive elements were more evident. A patchy irregular distribution of the ulcerative or hyperplastic process was the rule, with relatively unaffected portions of intestine not uncommonly interposed between diseased segments.

Comment on Roentgenologic and Proctoscopic Aspects.—A striking feature of this review was the consistence with which proctosigmoidoscopic and roentgenologic examiners, working independently, arrived at the diagnosis of an irregular, atypical form of ulcerative colitis which neither was able to classify as one of the more familiar forms. This should be significant, for although we do not know that we are dealing with a new disease entity, we know we are dealing at least with totally different manifestations from that of any of the more commonly encountered etiologic types of ulcerative colitis.

DATA ON FORTY-ONE CASES STUDIED AND REPORT OF ONE CASE

During the years 1936, 1937 and 1938 we have studied forty-one such cases which conform to the criteria of "something-that-doesn't-belong-to-the-usual-types." This is too small a group to do more than state that twenty-nine patients were males and twelve were females. They varied in age from 9 to 69 years, and twenty-two were between 20 and 40 years of age. We could not learn anything significant as to onset; in half the cases the onset was insidious and in the others, acute. In some instances antecedent dietary deficiency, respiratory infections, pregnancy or overwork were thought to be contributory factors, but these were no more important than they are in any other disease. The duration of the disease was of interest in that a number of those who had been ill for only a matter of weeks or even days would have as severe and as extensive damage of the colon and rectum as those who had suffered for several years; the duration seemed less a factor than the condition of the tissues or soil of the patient. The tendency to remissions and exacerbations, particularly after a respiratory infection, was similar to that experienced by patients with other types of ulcerative disease of the bowel. As might be expected, oddities were encountered, such as two cases of megacolon associated with ulcerative changes in the bowel. In one case of megacolon the symptoms were fever, loss of weight and constipation rather than diarrhea. The other patient with megacolon was a boy, 9 years of age, who had a history of diarrhea with fever, loss of weight and anemia. Three patients who were in their sixties gave an excellent history of a deficient intake of meats, milk and citrus fruits, the "tea and toast and vegetable diet" which is illustrated in *Case 7.*

Case 7.—A woman, aged 66 years, was brought to the Mayo Clinic and sent directly to the hospital on April 17, 1937. She gave a history of acute diarrhea which had been present for one week, during which time she had passed fifteen stools a day. In this brief time, she had lost 10 pounds (4.5 kg.) and was markedly depleted. She was not too alert mentally. Later, it was learned that, for years, she had been thrifty in all ways, including her diet, which had consisted chiefly of tea, cereal, bread and some vegetables. Rarely did she have meat, citrus fruits and milk. Prior to this illness, she had felt tired all winter.

On physical examination the smooth, dry, red tongue was a striking feature. Other than this there was nothing of moment. Examination of the stool for parasites, as well as cultures for Shigella dysenteriae, gave negative results. On proctoscopic examination the mucosa was observed to be thickened and edematous, with hemorrhagic areas, which did not conform to any of the usual types of proctitis. Roentgenologic examination after a barium enema gave evidence of a severe type of colitis which was most marked in portions of the transverse and descending colon. On the fifth day after admission, acute parotitis added to the suffering. The patient remained in the hospital twenty-three days, during which time she was fed as generously as possible and her diet was supplemented with vitamins B and C, as well as liver extract given parenterally. At this time, the concentration of hemoglobin was 14.5 grams per 100 c. c. of blood and the erythrocytes numbered 3,540,000 per cubic millimeter of blood.

When the patient returned in November, 1937, she said that she was not having diarrhea, but was not strong. Proctoscopic examination revealed a normal mucosa. Roentgenologic examinations gave evidence of remarkable improvement in the bowel and only minimal mucosal changes could be seen. The concentration of hemoglobin was found to be 11 grams per 100 c. c. of blood and the erythrocytes numbered 2,950,000 per cubic millimeter of blood. Examination of blood smears revealed evidence of macrocytic hypochromic anemia, which often is associated with ulcerative lesions of the bowel. The patient was still remiss in attention to her diet, but she promised to do better. In addition, a systematic course of injections of liver extract was prescribed. Examination of the blood four weeks later gave normal findings. At present (1941) she is in good

condition, provided she observes her proper diet. The life-long habit of frugality at the table is not easily overcome!

Three of this group of forty-one patients are known to have died from the disease. Two others underwent ileostomy five and eight years, respectively, after the onset of the disease. We are carefully avoiding any statement as to the final result of the remainder of the group until more time has elapsed. The very nature of any nonspecific ulceration of the gastro-intestinal tract, be it peptic ulcer, regional enteritis or forms of ulcerative colitis, precludes all but the uninitiated from making claims as to cure until years have elapsed.

Comment.—It is obvious that there is nothing unusual in the age, sex, duration of symptoms, nor of external physical findings of any patient with ulcerative disease of the colon. Only one point may be suggested, namely, that the extensive damage to the colon and rectum may appear in a few weeks after onset. The recognition, then, of this type of colitis rests on the examinations by the proctologist and the roentgenologist. Roentgenologic examination revealed the peculiar findings in the colon in all but one of the forty-one patients and he was too ill to have the examination. In nine cases the proctologic examination was reported as showing a normal mucosa, although the usual striking changes were found in the colon on roentgenologic examination. In three additional cases the first proctoscopic examination revealed normal mucosa, but on re-examination some months later, an abnormal mucosa, with bleeding mucosa in some parts was observed. These facts reiterate the necessity of conducting both of these examinations.

The question properly arises as to proof that these cases are not bacillary dysentery, amebiasis, lymphopathia venereum or tuberculosis. In many, repeated stool cultures and blood agglutination tests for Shigella dysenteriae were carried out. Seldom were less than three examinations of the stool carried out on successive days for the *Endamoeba histolytica*. Biopsy of rectal ulcers, direct smears from the ulcers and occasional inoculation of guinea pigs were done to disprove tuberculosis. The Frei test was performed in some of the cases. As all these cases were studied under the supervision of the colon service, there is no question that effort was made to rule out these diseases.

TREATMENT

We believe that the foundation for treatment of this type of disease consists of (1) a high protein diet, (2) careful attention to proper living habits, and (3) vitamin supplements. For those who are acutely ill and depleted, supervision in the hospital is essential.

Food.—Many physicians and other persons as well ask if there is not too much emphasis on deficiency of certain foods. That this is partly true is indicated by the enormous sum expended in this country for vitamins in 1940. However, two recent articles are among those which tend to confirm our opinion that a subclinical deficient state for certain foods does exist in many cases. Meyers studied the intake and excretion of thiamine among the Javanese and found evidence that the intake of thiamine was low, but the gross signs of beriberi did not appear. The feeding habits of the Javanese made for a low intake of thiamine and yet the excretion of the fraction on test doses of thiamine was the same as has been reported in the United States and Europe. He concluded that the body adjusts itself to a long-standing low intake of thiamine and yet exhibits a relative degree of saturation as shown by excretion tests. Hofmeyr recently summarized data accumulated on vitamin C deficiency of the South African native. It was found that the native was more resistant to deprivation of vitamin C than the European, probably because of his hereditary struggle with undersaturation of vitamin C. These studies add weight to our opinion that many Americans exist in apparent health on a subminimal intake of one or more essential dietary requirements. It is our opinion also that a deficient diet impoverishes the soil of the body and is one of the factors in the causation of any ulcerative disease of the intestine.

What constitutes the basis of an essential, highly nutritious diet must be repeated until all physicians cease to order the bland deficient diets of preceding decades. It is difficult to understand why meats are usually one of the first foods to be eliminated from the diet. When a patient is seen who is wasting away, whose bowels are moving frequently, tongue is becoming red, and ankles are swelling, it is not easy to know why the food which helps more than any other is stricken from the list.

The foundation of the diet should consist of dairy products, meats and citrus fruits. Individual sensitivity or allergy may preclude some

of these items. Pork is almost surely to be forbidden because of allergy in some cases and because of age-old prejudice in others. It is, however, an excellent food and is a much richer source of thiamine than beef. Meats in the diet should be selected in order of decreasing content of vitamin B group as follows: organs (liver, sweetbread, gizzard and kidney), pork, veal, lamb, beef, chicken and fish. Even with a generous intake of meat, 100 grams a day, it is valuable temporarily to augment the content of vitamin B complex with one of the supplements now available. Brewers' yeast is excellent, but it often increases intestinal gas and diarrhea; if tolerated, a full teaspoonful in water or tomato juice after meals is prescribed. Of the other various vitamin B products, the value is determined by the amount of the factors per spoonful or capsule and not by the cost per dose. It is our impression that the liquid products are more effective than the dried products. We do not know whether the vitamin B complex derived from yeast, liver, rice bran or something else is preferable; at present we think in terms of essential components such as milligram of thiamine, riboflavin, nicotinic acid, and so forth. If the patient cannot take vitamin B complex by mouth, it can be administered parenterally. This is probably the reason why parenterally administered liver extract has been of value.

If citrus fruits or tomato juice are not tolerated, ascorbic acid and vitamin P must be prescribed; the natural substance, of course, is preferable. Vitamin C can be administered orally, subcutaneously or intravenously in doses of 100 to several hundred milligrams daily. It should be remembered that, when any vitamin deficiency exists, the first therapeutic doses must exceed the amount required for maintenance of normal nutrition.

Usually butter and cream are tolerated, but milk and cheese may cause trouble. If cheese and milk cannot be taken, tribasic calcium phosphate is prescribed in doses of a heaping teaspoonful in a half glass of water in the middle of the morning and of the afternoon. Calcium is best absorbed when there is no food in the stomach; absorption does not occur in the stomach, but if food is present, much of the calcium may be bound to the food, especially to protein.

It is well to remind patients of the loss of vitamin that occurs in the handling of foods. Vitamin C is lost rapidly from orange juice on exposure to air and light. Thiamine and nicotinic acid are readily soluble in water so that cooking in an excessive amount of water and then discarding it results in the loss of much of these factors. A new pressure cooker which cooks foods rapidly and with a minimal amount of water is excellent from the nutritional and the gastronomical standpoints. The riboflavin content of food is decreased by prolonged and high temperatures.

In most instances there is no need for administration of extra vitamins A and D. Usually egg yolk, cream, cheese and butter will supply enough. As some of the "shotgun" vitamin products are rich in vitamins A and D and low in anything else except the advertising, it is well to stress again the fact that the amount of the desired vitamins in each dose and not the cost should be the determining factor in selection of the product used.

While we have laid much stress on the essential foods, it does not imply that no others are advised. In fact, we prefer to be liberal in our food advice and urge that any and all items that agree may be eaten. We likewise contend that food must be prepared and seasoned moderately so that it "looks good, tastes good and smells good." There is no objection to puréed foods, but rarely is this necessary for more than a brief period; in fact, we seldom suggest it.

Hygiene.—Good hygiene brings us immediately to the correct but disconcerting admonition of temperance or moderation. It is imperative that the patient know what is meant by fatigue, physical, nervous or mental, exposure, or any form of dissipation of his vital resources, and take measures to avoid them. It is so easy to tell the other person "to be and do good," but the complexities and responsibilities of life make the advice not easy to follow. Because this advice is not pleasant, enjoyable nor simple, does not minimize the necessity of striving to follow it.

In the records of nearly all of our patients is a history of overdoing in one or more ways that tended to exhaust their vitality.

Supplementary Measures.—Naturally many of our patients received ulcerative colitis serum and all but a few received the ulcerative colitis vaccine. Neither product was of any definite value in this unclassified type of ulcerative disease of the colon.

Many patients received emetine hydrochloride parenterally and usually treparsol or carbarsone

orally. This anti-amebic regimen was of no apparent effect. However, we know of no way to avoid this and, in fact, urge a trial of therapy in order more fully to disprove amebiasis; it is embarrassing to treat a patient conscientiously for months for "colitis," only to hear of a prompt cure elsewhere with anti-amebic treatment.

As none of these patients showed evidences of bacillary dysentery, either by culture or by agglutination studies, serum or vaccine therapy to combat bacillary dysentery was not employed.

The sulfonamide compounds that were available during 1936, 1937 and 1938 were prescribed in many of the cases, but we did not feel that they were of any particular value. As we continue to try the newer sulfonamide compounds, we are still none too impressed by their beneficial effect in this type of colitis, although use of sulfanilylguanidine has produced more encouraging results than any of the other preparations.

Tincture of iodine, ten drops in water three times daily for intermittent courses of a week at a time, was employed frequently, but its value, if any, is uncertain. The same is true of the inert compounds such as bismuth, kaolin or "karajel." Occasionally one of these will decrease the number and liquid character of the stool, but unless they actually do so, it seems futile to ingest inert material which merely adds to the duties of a sick and weary colon. Of course, sedation and judicious use of opiates were employed, but not as curative agents. It must be a rare occurrence for drug addiction to develop in a case of colitis; we do not belittle this possibility, but its rarity is such that we feel it needless to withhold moderate doses of an opiate during active phases of the disease.

Blood transfusions were administered to patients who were the more severely and seriously depleted. Whole blood is a good nonspecific measure, but in itself is not curative. Likewise if the patient's hemoglobin is more than 11 grams per 100 c. c., we doubt the efficacy or need for a transfusion.

Iron given orally is often indicated, but nearly as often it will increase the diarrhea. In the past year we have been intrigued by the fact that not only will some of these patients tolerate fresh parsley, but it causes a definite rise in their hemoglobin. This herb is usually thought of as merely a nuisance or at best a decoration. However, it is one of the richest natural sources of iron and we wonder if it may not carry some other factor that is helpful in patients with secondary anemia. Sweet clover and alfalfa have yielded interesting substances! We suggest that the patient eat a third of a cupful of chopped parsley three or four times a week. It may be eaten as it is, or flavored with any oil or salad dressing that agrees.

We do not employ nor recommend any form of local rectal applications nor the use of medicated colonic irrigations for this type of disease.

Sometimes the value of any medical measures except transfusions and opiates is viewed with pessimism. As a matter of fact, and with our present knowledge, it would not be unfair to hold that medical measures other than transfusion and doses of opiates are of value for this type of colitis. "Skilled neglect," transfusions, opiates, nursing care, a rich fuel intake and good hygiene are actually the measures that are of value. No progress could be made if such an opinion became fixed, simply because of present inadequate tools, for in order to progress new therapeutic suggestions must be evaluated carefully as they appear. Honest optimism and not biased enthusiasm should be our aim in treatment of this condition.

SUMMARY

Forty-one cases were encountered at the Mayo Clinic in the years 1936, 1937 and 1938 in which a diagnosis of ulcerative disease of the colon of the unclassified type was made. The diagnosis was based on proctoscopic, roentgenologic and clinical findings which did not fit any known type of ulcerative colitis.

In this unclassifiable group we are dealing with a condition which has thwarted the efforts of the clinician, the roentgenologist and the proctologist. The regularity with which the last two have agreed in their confusion is a convincing proof of the enigmatic character of the problem. Occasionally, that is, in about 20 per cent of cases, the proctoscopic examination reveals nothing of significance. However, on assembling the data we have found when the condition fits the unclassifiable group that all of us have failed, independently, to arrive at a diagnosis. Roentgenographic, proctoscopic, bacteriologic and serologic studies and biopsy have all failed to reveal any features by which a more exact diagnosis can be made.

Treatment of this type of ulcerative disease of the colon at present consists of a high protein diet with vitamin supplements, advice concern-

ing hygiene and any supplementary measures which may be necessary.

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DISCUSSION (*Abstract*)

Dr. Thomas T. Mackie, New York, N. Y.—All of us who have been studying inflammatory diseases of the large intestine have seen the type of process which Dr. Brown has emphasized, a process which does not fall into any of the fairly well defined entities with which we are familiar. He has done a most important service in debunking many previous concepts about therapy. I am very glad that he omitted to mention surgery because I happen to be one of those who feel that in the past a great deal of exceedingly deforming and completely useless surgery has been done. I refer particularly to appendicostomy, cecostomy, and colostomy. Unfortunately, there are certain individuals who probably cannot be restored to a life of normal activity without radical surgical therapy. They, however, have to be selected with extreme care.

It seems to me that up to the present time the effort to classify these inflammatory conditions has been based altogether too much on two factors: one, the clinical appearance, the appearance of the lesions as seen through the proctoscope; and the other, the attempt to recover a specific etiologic organism.

The fact that we have a considerable and an important group of inflammatory conditions affecting not only the colon but the small intestine as well, which we speak of as idiopathic, a synonym for ignorance, indicates that the approach from the point of view of study and investigation up to the present time has been deficient.

There is great need for much more detailed study of the microscopic pathology of the various conditions which now exist either as clinical or protozoologic entities, for example: if one examines suitably prepared material from a satisfactory specimen of amebic infection of the colon, one can demonstrate by serial section and patience, that the extension of the amebae from the superficial mucous membrane is a perivascular extension, passing through the breaks in the muscularis mucosae along the penetrating vessels and the lymphatics. The same is true of the invasion of those organisms into muscularis propria. If, by contrast, one takes similar sections from the non-amebic inflammatory type sufficiently early in the development of the lesion, one gets conclusive evidence that the infection, whatever it may be, tends to progress along the lymphatic channels, because the vessels are surrounded by perivascular accumulations of inflammatory cells.

That raises another question not only in the colon, but the same is true of the small intestine. We see areas of inflammatory reaction, and Dr. Brown presented x-ray films this afternoon demonstrating areas of involvement separated by areas of apparently normal tissue. What lies behind these boundaries? What is the mechanism? The answer today is not known. That suggests another potentially important field for exploration: study of the normal and pathologic anatomy of the lymphatics of the intestinal wall and the mesentery.

THE SCOPE OF PHARMACOLOGY*

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Ever since the evolution of pharmacology from the older departments of materia medica, pharmacy, and therapeutics, there has been discussion as to its encompassing sphere as a teaching unit in the medical curriculum. The term itself, pharmacology, should leave no doubt as to the proper scope of its activities; it implies the study of drugs in all respects. It might be taken by some that medical schools themselves are occasionally not so sure as to the intent of pharmacology, as evidenced by the names borne by this medical discipline in various medical institutions. Sometimes it is called the department of pharmacology, materia medica and therapeutics; or the department of pharmacology and pharmacy; or the department of pharmacology and toxicology. Recently, a complete deviation in nomenclature has been proposed in the introduction of the term biotrepology, indicating a study of tissue reaction to the presence of chemicals. But for the limitations imposed by practical demands, such a study would seem to represent an ideal conception of what pharmacology should be.

To me, in view of present conditions, the broad definition of pharmacology is entirely satisfactory: the study of drugs. Because it is taught to medical students, those aspects of it having more directly to do with the use of drugs clinically should be stressed more than others. Hence the study of drug action or pharmacodynamics becomes of primary importance. There is universal agreement as to this. But what of some of the other facets of the subject? Discussion with alumni of our institution points to lack of adequate instruction in pharmacy, materia medica, prescription writing, and clinical pharmacology or therapeutics. I believe that similar criticisms might also be made by graduates from many other medical schools. Hence, first, it may be constructive to discuss these points.

It should be borne in mind throughout discussions such as this, that the purpose of the instruction in a medical school is to prepare the graduate as a potential general practitioner in an

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average community. And also, that while medical information of a much wider variety might be generally desirable, most medical disciplines, including pharmacology, are very much restricted as to available time, and so, most reasonably, things of first importance are given first preference. Furthermore, it is now well realized that the medical graduate is not the finished physician; but he should be a person well versed in medical fundamentals to which he can add during his hospital years and subsequently, those details essential for the successful practice of medicine. This condition indicates the serious responsibility of the hospital to its interns and resident staff, a responsibility not as yet, I am afraid, completely appreciated.

Now for the points of criticism. We give relatively little instruction in pharmacy, other than to indicate certain general principles and to demonstrate the manufacture of the more common pharmaceutical preparations such as tinctures, waters, and pills, and the isolation of several "active principles." We limit ourselves thus, to a large degree, on the assumption that the great majority of our graduates will practice medicine in localities adequately supplied with retail pharmacies. We have found, however, that some of our men locate some distance from pharmaceutical service and hence, feel the need of more instruction in this phase of pharmacology. Others, although having their practice in larger communities, feel that greater knowledge of pharmacy might enable them to appreciate better the problems of their pharmaceutical friends, and that it would assist them in their prescription writing and contacts with detail men. Perhaps we have allowed the pendulum to swing too far; at any event we are contemplating some enlargement of our instruction in pharmacy to care for, at least partially, this situation. For those who desire greater practical proficiency in pharmacy, it is recommended that they pursue this subject directly under strictly pharmaceutical auspices. Incidentally much good can be accomplished by a closer alignment between the profession of medicine and the profession of pharmacy; excellent opportunity, which should not be overlooked, is offered during the teaching of pharmacology to encourage this relationship. As regards what we call materia medica, brief discussion, didactically and in the laboratory, is given to the matter of sources of drugs, to methods of assay, the so-called "active principles" and to the more common incompatibilities. Very little is given regarding the physical properties, sources, and solubilities, of the individual drugs, except the most important ones; the student is expected to familiarize himself with the pertinent data as best he can. And so it not infrequently happens that the graduate, as well as the student, is not positive whether a drug in question is a liquid, solid, or gas. At present this deficiency cannot be remedied; again limitation of time largely dictates our policy. Strangely enough, we hear little concerning deficiencies in knowledge concerning drug dosage.

Prescription writing has for many years received especial attention in our department. Several lectures are given in the sophomore year on the fundamentals of this art; and throughout the course constant exercises are given in the prescribing of the drugs being considered pharmacodynamically. Also the student is required to write 50 prescriptions to be turned in at the end of this sophomore course. Furthermore, during the senior year more such training is given in a course of therapeutics given under the supervision of the pharmacology department. The practical results from this rather intensive theoretical instruction have been far from satisfactory. As a matter of fact, the most common criticism of our department is that the student and the graduate know almost nothing about writing orders for drugs. I do not believe that our department can do any more; it seems to me that the best solution of the problem is to have the fundamentals of prescription writing taught in the primary course of pharmacology, but hold the various clinical departments responsible for instruction in putting these fundamentals into practical use. Admittedly it is important that this phase of pharmacology be properly developed, and we are convinced that cooperation between the department of pharmacology and the clinical departments will materially assist in its solution. While on the subject of prescription writing, I would like to recommend sharp curtailment in the use of Latin and complete abandonment of the apothecary system. It is high time that English be given preference and the metric system used entirely. These encumbrances are but examples of how tradition clings to the use of drugs. Sometimes, as for instance in the case of the examples just mentioned, this is to the disadvantage of pharmacology. Other basic medical sciences appear to be quite free of such traditional hinderances.

As previously implied, the primary aim of instruction in pharmacology is to enable the graduate to use drugs intelligently in the treatment

or alleviation of disease. While it is impossible and even undesirable for an interested teacher to ignore therapeutics completely in the teaching of sophomore pharmacology, we feel that the second year is hardly the time in which therapy should be taught exhaustively. This should largely be the responsibility of the clinical departments. They only too often fail however, either because of lack of interest or because their personnel fails to recall the fundamentals of drug action and incidentally, prescription writing. We do several things at the Medical College of Virginia which seem to be of help. During the senior year 16 lectures are given by a clinician of wide experience regarding emergency therapeutics. This is the course previously mentioned which is sponsored by the department of pharmacology. In addition, and with the collaboration of the department of medicine, we conduct a series of about ten conferences on therapeutics, also in the senior year, following the "Cornell" plan. In this course the department of medicine presents an illustrative case and discusses the therapeutics employed, giving actual prescriptions when possible. The pharmacology department then presents the therapeutics from the basic pharmacologic viewpoint. The atmosphere is kept very informal, and we have been successful in having the students join in our deliberations. This innovation we feel has been extremely fruitful, relating in a definite fashion fundamental pharmacologic principles with the practical use of drugs. A somewhat similar arrangement is being worked out with the department of surgery in connection with the use of anesthetics and other drugs restricted more or less to surgery.

Teachers of pharmacology are frequently criticized because of the large number of drugs, many of questionable value, included in the course or in their texts. That this is so is not our fault. We would like to delete many drugs from our curriculum. Many of us however, are largely guided by the demands of the recognized drug compendia, the clinicians, and the examiners on the various boards. Perhaps we are too gullible. Like the text book statement long since proven wrong, it seems to take 40 years for a drug of highly dubious value to be dropped from our therapeutic armamentarium. To get some idea as to the number of drugs a student and practitioner might encounter in his reading, twelve contemporary standard medical text books were carefully scanned for drugs, as was one volume of the *Journal of the American Medical Association* (1939). The number of different drug preparations listed in these authoritative tomes totaled the amazing figure of 1,200. Our hospital pharmacist has informed me that during a year inquiries are made on as many as 2,500 different preparations. In fine juxtaposition to this is the assertion of the near therapeutic nihilist, one of whom is cloistered in almost every medical school, that there is actually need of only some eight or a dozen drugs. Personally, and I believe this to be the general opinion among teachers of pharmacology, I would prefer to teach soundly certain pharmacologic principles and to restrict, with but few additions and deletions, our specific deliberations to those drugs and diagnostic agents listed in "Useful Drugs" published under the auspices of the American Medical Association.

Fifteen years' association with the teaching of pharmacology has resulted in certain definite convictions which, although some might not fall strictly under the title of this presentation, I would like to discuss briefly in closing.

(1) I think that pharmacology should be taught primarily from the point of view of its usefulness to the practicing physician. To facilitate this premise each department of pharmacology should have in it at least one medically trained instructor. Furthermore, a combination of medically and non-medically trained instructors makes for a well balanced department both from the standpoint of teaching and research.

(2) Those responsible for guiding the destinies of our medical schools should pay stricter attention to the qualifications of those they appoint to pharmacologic teaching positions. It is astounding that a dean who would give no thought whatever to the appointment of a man to the professorship of surgery unless the candidate had had many years of exacting experience in his specialty, will apparently without second thought, appoint a chemist, a pharmacist, or a physiologist to the chair of pharmacology or as the sole teacher of the subject. I often wonder what would be the reaction of the public if it knew the meager qualifications of some of those appointed to teach their future physicians in matters pertaining to drugs.

(3) The various foundations should give some practical support to pharmacology. Why they have remained aloof from a subject so important to the public health, particularly in view of their expenditures in more remote fields, is rather astonishing.

(4) Serious consideration should be given to

increasing the time, personnel and budget allotted to the average department of pharmacology. Probably no other division of medicine is growing so rapidly as evidenced for instance, by the enormous increase in the number of synthetic drug derivatives being made available, and by the increased need created by the development of the various hormones and vitamins.

(5) From a pedagogic standpoint, pharmacology should not be taught until the student has had biochemistry, physiology, and pathology. From the same viewpoint, I think that toxicology should be an integral part of pharmacology and not segregated from it.

(6) Finally, pharmacology offers such fine opportunities for service that those of us interested in public health should seek to direct into its fold promising, well trained men and women. With the possible exception of pathology, it is the least crowded of the so-called basic medical sciences and the one with the brightest future.

DISCUSSION (*Abstract*)

Dr. John W. Spies, Galveston, Tex.—Pharmacology is coming into its own again, so to speak. For many years it was somewhat relegated to the past, but now, with chemotherapy in the vanguard, and with other things coming to the fore, many of us believe that pharmacology is going to assume great importance.

Dr. Gregg, Director of the Division of Medical Sciences of the Rockefeller Foundation, emphasized this at the meeting of the Council on Medical Education in Chicago in 1940.

In the University of Texas School of Medicine, where I am Dean, we had a Department of Therapeutics which was staffed by only one person, who gave didactic lectures to the junior students. Aside from that we had a Department of Pharmacology which had a fair set-up, but there was no linkage between the Department of Pharmacology and the clinical departments; so the Department of Therapeutics was amalgamated with the Department of Pharmacology; and what we try to do is to form a bridge between the Department of Pharmacology and the various clinical departments.

There are various methods of doing it, and one that we have found useful is to give what is sometimes known as a dual assignment. A person in the Department of Internal Medicine, for instance, may be given a definite appointment in pharmacology, and vice versa. The same arrangement can hold with pediatrics, surgery, and so forth.

Dr. Lee Sutton, of Richmond, Virginia, Dean of the Medical College in Richmond, is here and undoubtedly he and our Chairman have had ample time and opportunity to discuss these problems among themselves. I should like to hear from Dr. Sutton.

Dr. Lee E. Sutton, Richmond, Va.—Dr. Haag and I have discussed our problems and I think the school on the whole is quite in sympathy with his program. We believe that pharmacology should have close contact with the clinical departments, and there should be correlation so that the pharmacologists will know what we are trying to do in the clinical departments.

Dr. Spies.—As I remember, though, there has been nothing worked up between pediatrics and pharmacology.

Dr. Haag.—Not particularly.

Dr. Spies.—It has been between medicine and pharmacology?

Dr. Haag.—Yes.

Dr. Spies.—Pharmacology is something we are thinking of more and more, and how to translate the knowledge therefrom to clinical practice is, of course, extremely important. I personally would be glad to have any suggestions from anybody, because we have this problem with us now and I am sure that many of the schools have it.

Dr. F. R. Bradley, St. Louis, Mo.—There is one thing about Dr. Haag's paper which is fundamental and applies to pharmacology and all teaching. That is having classes on an informal basis and making the student feel interested and inclined to contribute instead of having a lecture. I think Dr. Haag would call his type of class a round table discussion.

I am struck with the fact that our departments of pharmacology are missing a bet. I learned this recently when I had occasion to go to Indianapolis, Indiana, to check on new clinical laboratories that we are putting in the hospital. I visited Eli Lilly, who took me to Indianapolis City Hospital, where I found Dr. Page using an entire unit of the hospital for pharmacologic research for Eli Lilly. If drug firms such as Eli Lilly use our wards and our beds for pharmacologic research, why do not our departments of pharmacology use us for the same purpose? Why have we not, as Dr. Haag has pointed out, a clinical member from the hospital and pharmacology and vice versa?

The multiplicity of drugs is such that we cannot apply the principle of perpetual inventory to our drugs. We have a perpetual inventory in our large storeroom, but the huge number of items in our drug store prevents our using a standard accounting principle, and I can never know what the inventory is in our drug store.

To repeat, I think that the departments of pharmacology in medical schools should conduct research, utilizing the wards of the teaching hospitals connected with that university. I am Superintendent of Barnes Hospital, and from the standpoint of a hospital superintendent it would be much easier for me to handle our staff physicians, who get their information from the detail men and from Stearns and Eli Lilly and other companies, if they could get their basic information from the department, particularly when they are students.

Dr. Spies.—Have you any limitation on the number of drugs you have? From the administrative standpoint, do you find you have to set a limit?

Dr. Bradley.—We try to. On our wards we have a standard. At one time we had a formulary which is now obsolete. To that extent we try to limit the drugs. In our private rooms we are practically at the mercy of our staff, who order whatever the detail man suggests at all times.

Dr. Spies.—Would not the pharmacologist be of great aid to you in trying to eliminate duplication of drugs and a lot of drugs that perhaps are useless?

Dr. Bradley.—Certainly. The only thing we can do is to have our pharmacist, who is a full-time man, a graduate of Ann Arbor, Michigan, help our private men, but there is no contact with the Department of Pharmacology of our medical school.

Dr. Paul C. Eschweiler, Little Rock, Ark.—High pressure salesmanship is encountered particularly by those of us in private practice with detail men. What a long jump there is between our course in pharmacology and what we use in practice!

It is the large series of proprietaries that give us our difficulty rather than official drugs themselves.

I have been interested in the teaching of therapeutics and feel that that should be a combined department. This year we are trying to give therapeutics in the junior year, listed under the Department of Pharmacology. We have gone into conference with the men in that Department before considering discussing drugs so that there would not be contradictions that would otherwise occur. I feel very strongly that internal medicine, pediatrics and surgery should at least combine their fundamentals with the Department of Pharmacology.

Dr. Spies.—Dr. Eschweiler, what do you think about Dr. Bradley's point? Do you think that the pharmacologist could take more active interest and help out the hospital administration a great deal in the matter of drugs? From our own experience in Galveston, that is an extremely important thing. We are studying it right now, and, as I said, it would be very helpful to me personally to have some of these facts brought out from your own experience. It has seemed to us, and if I understood the Chairman and Dr. Bradley, they also think that it would be of extreme help to have the pharmacologist take an interest in the drug room, if you want to call it that, and not just have something that happens between the pharmacist, we will say, and the person who sells the drugs.

Dr. Eschweiler.—You could go even a step beyond that. The impression on the students and the house staff of having the Department of Pharmacology do clinical testing on the ward would be great. I can think of no better way to drive home the importance of the course in pharmacology in practical therapy. Instead of having the drug houses come, it seems a shame that we do not use our own departments on the wards to impress the students and the house staff particularly. The students will listen to the pharmacologist, but the house staff has ideas of its own and it is the most susceptible to the detail men of probably any group.

Dr. Spies.—How do you accomplish that from a practical standpoint? Would you assign or have some member from the Department of Pharmacology in one or the other departments, or vice versa, or do you think that this method which is commonly employed is better, whereby somebody who is interested in one department or who is attached to that department and develops an interest in another department, goes to a department head and says, "I am interested in doing this?" The other department head always says, "Come over. We have ward rounds at such-and such a time." We have found in our own experience that that is much like Mae West's saying, "Come up and see me some time." It does not work out, quite. In other words, is it better, or is it not, to try dual assignments from one department into the other? If a man in pharmacology, for instance, is qualified, why not give him a very definite assignment with a title in the department of internal medicine, and vice versa?

Dr. Eschweiler.—I should think that would be an excellent suggestion, and then perhaps ways to introduce it would be to have some digitalis assay studies done by the Department of Pharmacology, the pernicious anemia factor, and so on. In that way the house staff and students would be able to break down their previously existing prejudice and habit of thinking, "Thank goodness, now we are through with pharmacology and we will take medicine." It would be an excellent suggestion.

Dr. Charles H. Neilson, St. Louis, Mo.—Where does pharmacy end and pharmacology begin? My experience with this topic is that if you put the pharmacologist into the hospital, he becomes a pharmacist more or less, unless you are particular in your instructions. I, of course, approve of the idea brought out that we should have a correlation, or perhaps an integration of pharmacology with internal medicine, but how to do this is difficult. It would not be valuable in ward rounds to have a pharmacologist tagging along when you are discussing diagnosis. In order to obtain advice from the pharmacologist which would be useful and worth while, it would be necessary to have special ward rounds in which therapeusis is taken up, and not diagnosis.

Dr. George T. Caldwell, Dallas, Tex.—I want to say, as a pathologist, that I have reason to know relatively little about pharmacology, but there is one thing that impresses me immensely about the subject which is up for consideration at present, which can be illustrated by pathology, I think. Pathology has benefited greatly by the practical application of its methods to human disease problems. I have the feeling that other fundamental departments in medical schools have not had that advantage, probably because they have not assumed the responsibility. But just at the present time it seems to me that one of the great needs in medicine is for experimental physiology to be extended from animal investigation over into human investigation. I do not want to be understood as criticizing in any way the experimental work which has been done by physiologists in the past, but there is a crying need at present, especially in teaching institutions, for physiologic knowledge which has been accumulated to be applied at the bedside. Bacteriology has lagged immensely in practice, although as a separate experimental study it has gone on satisfactorily. There is still an additional step that it should take. As all of you know, bacteriology is still at a relatively low ebb in most of our teaching hospitals. I am quite satisfied, too, that the next great step that pharmacology should take is to become an integral part of the discussion of therapy in patients, and if all our fundamental departments should add to their present very excellent experimental phases, the practical applications of those fundamental sciences, we should advance medicine rapidly once more.

Dr. P. A. Shaffer, St. Louis, Mo.—It is necessary to provide some solvent to compensate for the increasing dispersion of medicine resulting from specialization. One

solvent to bring subjects and departments closer together would be joint appointments of individuals in two departments to bridge interests and activities. How to erect these bridges depends upon the personnel available and the particular situation that exists. It is not a simple problem. I would utter a word of caution. The reason medical science is as good as it is today is because of the specialization; the reason that the practice of medicine is as good as it is today is because the practicing physician knows as much about medical science as he does. Now, I protest converting the pharmacologist into a pharmacist or even giving him clinical duties in the hospital. If you do, you will injure the contribution of experimental pharmacology to the advance of medicine. But by all means build all the bridges we can between the laboratory departments: pharmacology, biological chemistry, physiology, and clinical departments. Every young member of the clinical staffs should spend a part of his time in one or another of the laboratory departments. No one can now define the boundaries of these subjects; they look more or less alike. Build bridges between them and those responsible for the care of patients, and expect not only the pharmacologists, since we are talking about pharmacology, to go into the wards, but also I would plead for a larger inclination on the part of the clinicians occasionally to go back to the laboratory, participate in the teaching and thereby learn something of medical science.

Dr. Spies.—You would have the traffic go both ways on this bridge.

Dr. Shaffer.—Absolutely.

Dr. Bradley.—I would like to define my plea for this contact between the department of pharmacology and the hospital. From the hospital superintendent's standpoint, it might be done through the house service. The department of pharmacology should have a physician member of its staff assigned to intern duty on internal medicine, and we could rotate our interns on internal medicine to pharmacology. We rotate services in preparing our men, let us say, for the American Board of Surgery. Each assistant resident spends four months in the pathology laboratory. In the postgraduate courses in otolaryngology and the eye, those men spend nine months, part of which is in anatomy. I think the liaison that I mentioned would thereby be specified and would meet the requirements of Dean Neilson and Dean Shaffer. I did not mean to imply, even, that the pharmacologist should ever be anything else but a pharmacologist, but I do think that the hospital can well afford the connection with the department through its house service, not only for the training each receives from the other, but in the advancement of teaching and practical research.

Dr. Spies.—Dr. Conley, there has been some discussion here toward having a correlation of course between pharmacology on the one side and the clinical aspects on the other, and I wonder if you would be kind enough to tell us how you handle the course in pharmacology at the University of Missouri and what suggestions you might have for us.

Dr. D. S. Conley, Columbia, Mo.—Our pharmacology department in the University of Missouri takes care of all the electrocardiographic material for the hospital. Our Professor of Pharmacology is electrocardiologist of the hospital. He gets his material from the hospital to teach pharmacology. Outside of that I do not believe there is any very close connection.

Dr. Robert U. Patterson, Oklahoma City, Okla.—In the University of Oklahoma, we have endeavored for many years to have a definite liaison between every clinical department and the important preclinical departments, including that of pharmacology. It works exceptionally well with most departments. It has been difficult at times to effect the close liaison we desire with general medicine and pediatrics, and they are the most important from our standpoint in teaching medical students. The representatives (we place the obligation upon certain men so that they will be available) actually meet with some of the classes of pharmacology in the medical school and reinforce what the pharmacologist teaches about the utilization of and the action of various drugs and their clinical or therapeutic application. That has worked very well for pharmacology. The relation is well established with biochemistry and with physiology. From what Dr. Haag has said, I think we will try to extend these liaison relations.

One word about what Dr. Bradley spoke of, that is, the multiplicity of drugs used in hospitals. With my training I naturally have been used to a limited use of and number of different kind of drugs. So in Oklahoma we have tried to limit them by getting up a list of standard drugs for the hospitals, of proven value, to which the clinicians are limited unless they will give definite reasons why they should use something else. To bring that about we have a special committee of the hospital composed of the medical director, the chief of the medical service, who is over all of the staff working in the wards and in all outpatient services, and the professor of pharmacology. They reduced the list of drugs by several hundred the first year. A report of that kind is made every six months and we keep reducing it or adding to the list of drugs to keep available those that are of definite value and from which one may expect good results. It does not mean that in an emergency, or when some special drug comes out, it cannot be obtained, but the person who wants to use it has got to explain why it is needed, taking it up with the chairman, who is the head of the department of medicine of the hospital. In an emergency we do not ask any questions, but obtain the required medication promptly. That is what we have been doing in the hospitals controlled by our school. We do have definite liaison between the department of pharmacology and the clinical departments, particularly with the two with which we feel it most important to have closest cooperation. We do have a limit on the number of kinds of various drugs that are used in the hospitals so that we will not have requests for "pet drugs" from those who want to use them because they see something advertised and desire to use them without knowing much about their value.

Dr. O. S. Gibbs, Memphis, Tenn.—I have been teaching pharmacy at the University of Tennessee for some twenty years, but as I am not teaching any more, I may speak freely. Frankly, I think most of the problems that have been raised can be boiled down to one word, economics, economics in money and economics in time. Most important of these is economics in money. The dean has a limited budget and naturally he cuts down the departments to the least he can get by with. Unfortunately, pharmacology has been regarded as the poor little Cinderella of medicine, so she has been living in the academic kitchen. You have also

economics in the medical student's schedule. You have to apportion his time to the best of your ability. In consequence, pharmacology again has been caught, as it were, between two moving glaciers: on the one hand, physiology, very often encroaching altogether and shoving pharmacology in one room; or, alternatively, the old professor of materia medica in medicine went strictly into the diagnostic field and left pharmacology to somebody else, who was not appointed.

But all of a sudden this poor little Cinderella of medicine, pharmacology, has been kissed by the prince of chemotherapy and suddenly she becomes of paramount importance to everybody. They call her a new name now; she is the little Princess Chemotherapy, but she is still pharmacology. The consequence is, everybody is running around with his tongue hanging out, especially the Government, looking for pharmacologists, and what is really funny to us professionals is that they do not know what they are looking for.

Dr. Haag and I usually disagree on minor points only, but I disagree entirely with his idea of pharmacology in this respect: that I think pharmacology and pharmacy can be dissociated as clearly as surgery and surgical instrument making, absolutely as clearly. A surgeon cannot possibly use his instruments unless he knows something about their construction, but there is not a surgeon living who knows the composition of the steel in his instruments, because those are trade secrets, anyway. There is hardly one surgeon in a hundred who knows the degrees to which you sharpen a scalpel, which happens to be 17, by the way. Therefore, you cannot expect the pharmacologist also to know all the details of the drugs. It is not his business any more. But he must know enough about those tools to be able to use them with a reasonable degree of intelligence. If the surgeon did not know that the knife was sharp he would be everlastingly picking it up by the blade and cutting his fingers. If he did not know a cautery was hot he would be continually doing himself damage instead of his patients. If a man did not know that strychnine is poisonous or that morphia will produce habit or that sulphuric acid will burn hose, he is obviously grossly incompetent.

In my last course I made the students pass a practical examination in spotting ordinary drugs. It did not take very long. They naturally objected very strongly to doing it, but it was a very good piece of training. No longer did I have prescriptions written solids for liquids, and vice versa, and I consider that point was very easily settled.

The pharmacologist is a man who studies function. He is not interested in the chemistry of a drug because frankly it does not mean anything more than a possibility. The pharmacology of magnesium sulphate, right up through every kind of chemical complex is to produce central nervous depression, so that the idea that looking at the chemical formula enables you to say it will do so-and-so, is a pipe dream that only chemists have; no experienced pharmacologists have it. We know it can not be done. You can look at a barbituric acid, and say "that is a typical barbiturate." You give it to a cat and it may produce strychnine-like convulsions. That is also true of morphine derivatives and so on. Chemistry is not the answer to pharmacology. The answer to pharmacology is to test the drug on function and see what it does. Therefore, there is only one way to learn pharmacology, and that is to test things on function and go on testing them on function until in the end you are thinking in terms of function and the modification of function; whether that function happens to be normal or abnormal is immaterial. That is a true pharmacologist. However, he is perfectly capable, in spite, perhaps, of a little demurrer, of going over into the hospital and talking about pharmacology on a human being.

The key to pharmacology as it is being studied and recognized is a quantitative action, and it requires quantitative study. Why it is difficult to translate from the laboratory directly to the clinic, is that in actual fact if we set up fifty experiments in the laboratory and give fifty different medical students a drug, they will get fifty different quantitative results. The pharmacologic laboratories in this country are doing studies on the actions of drugs, not on the chemistry, the molecular weights, or what plant they come from, but what they do to living functions.

As to limitation of drugs in the hospital in Memphis, to prevent young residents from ordering unneeded expensive preparations, we formed a therapeutic committee, on which there was a representative of the chief of staff, the chief of surgery and I as pharmacologist. We grouped our drugs into what you might call first line, second line, third line, and strictly experimental. The first line drugs were the ones which were recommended for ordinary cases as the routine treatment, to be used first, unless there was some very good reason for using something else. They were picked on the basis of a therapeutic cost index. We found out what we could get for our money. We gave iron and we gave the best iron at the cheapest price. We probably used the citrate, and so on. Second line drugs were used if the first line did not work. There was a variable choice in the second line. The third line consisted of obscure drugs. (Incidentally, I rather deplore the idea that drugs should be dropped from the Pharmacopeia altogether because some people can not make them work.) And finally, the purely experimental, the dangerous, or ferociously costly drugs we put in a special group whose use was only sanctioned by the chief of the department.

Dr. Haag (*closing*).—In Richmond, as far as drugs used in the hospital are concerned, we have a committee, which regulates, to a large extent, the drugs that are to be used on the wards, but it has practically no control over drugs used on private patients.

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EDITORIAL DEPARTMENT

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GROWTH HORMONE

The very existence of a growth hormone has been questioned in numerous quarters. It has been claimed that any apparent growth stimulating activity of anterior pituitary extracts was due to their contamination with the so-called target hormones of the anterior pituitary: the breast-stimulating, follicle and corpus luteum and testicle-stimulating, thyroid and adrenal-stimulating products. The anterior pituitary gland has been shown to be a storehouse and perhaps a factory for many potent substances which act upon other glands of internal secretion. Laboratory workers have been slower in purifying and crystallizing the anterior pituitary hormones as insulin, theelin, progesterone, corticosterone, parathormone and thyroxin have been crystallized. The anterior pituitary hormones are used for the most part in impure form, merely as concentrates. Investigators have suggested that the apparent growth-stimulating property of the anterior pituitary was merely a combined effect of one or several of its target hormones.

Others have accepted the independence of the growth hormone of the anterior pituitary. Lea and Schaeffer noted that animals which were treated with growth hormone increased their growth rate remarkably even if their food allowance was restricted to that of a control group which was developing at the normal rate. They concluded that the growth hormone promotes a more efficient utilization of food for tissue building.

Herbert Evans[1] and associates at the University of California have prepared a much purer growth hormone, free of practically all traces of the recognized target hormones. Their product contained no lactogenic, gonad-stimulating or adrenal-stimulating material.

In their work, a number of animals were hypophysectomized. They were then divided into two groups, both of which received identical quantities of food, and one of which was treated with the growth hormone. The animals which received growth hormone increased in weight nearly 25 per cent more than the controls, and this was accomplished in a treatment period of about ten days; and, as was said, with no extra food.

Specific organ weights at autopsy were compared. For the most part, organ weight gain was proportional to the total body weight gain. Adrenals, kidneys, stomach, thyroid, and so on, in the treated animals grew at a rate approximately proportional to the general acceleration. A notable exception was the thymus. Its weight in the anterior pituitary treated group increased proportionately more than that of any other tissue. This is remarkable, the California workers say, in view of the fact that the thymus is not necessary for normal growth, or for the stimulation of growth by the anterior pituitary growth hormone. Thymectomized animals respond to growth hormone. The difference in other organs was not notable. The growth rate of the liver was possibly decreased by hormone treatment.

The idea that the anterior pituitary growth hormone may be a thymus target hormone is of course disproved by the fact that growth hormone acts in the absence of the thymus. The preparation might be contaminated by a substance which stimulates the thymus, and from which it may eventually be freed.

The experiments have, of course, for the most part, extended over only a brief period. Studies

1. Marx, W.; Simpson, M. E.; Reinhardt, W. O.; and Evans, H. M.: Response to Growth Hormone of Hypophysectomized Rats when Restricted to Food Intake of Controls. Amer. Jour. Physiol., **135**:614 (Feb.) 1942.

upon the maturity and senescence of these rapidly grown animals will be of interest, as are the effects of growth hormone upon adult and aged animals.

If human beings continue to be exterminated at the rates current in 1941 and 1942, a new stimulant to growth and maturity may be needed long before it is clinically developed. This may be one of the secret weapons of future armaments: a new source of quickly matured manpower.

ETIOLOGY OF GOITER

One of the most delicately balanced organs in the body is the thyroid. It tends to increase its size in response to needs or as a reaction to various strains. It may enlarge in pregnancy and in adolescence and in response to a deficiency of iodine in the diet, or a deficiency of other nutritive elements. It also responds by hyperplasia to an excess of certain food elements: too much cabbage or soybean in the ration, excess calcium, or injection of cyanides, can produce thyroid enlargement, as can injection of the thyroid-stimulating hormone of the anterior pituitary. Probably most of the hyperplasias are reversible in the early stages. It is possible that any of them carried sufficiently far could cause an irreversible destruction of the gland and eventually cretinism.

The various physiologic causes of hyperplasia demonstrate that the ductless glands have a considerable degree of elasticity, and it is this actually which provides the adaptability of the individual to his environment. There are thus toxic hyperplasias, in response to an injurious agent; there are the food deficiency hyperplasias, chiefly the iodine deficiency hyperplasia; and the anterior pituitary hormone hyperplasia, which, however, possibly precedes the other two varieties.

Investigators at McGill University and the University of Rochester[1] have studied the retention of iodine by normal and hyperplastic thyroid glands in order to learn whether the hyperplasia increases or decreases the utilization of iodine by the gland. One might surmise that an abnormally enlarged thyroid would absorb this element less efficiently than the normal control.

Leblond and Mann[1] kept groups of animals on an iodine-deficient ration over a period of more than two months, until the thyroids showed some degree of hyperplasia. They then injected a radio-active form of iodine, and twenty-four hours or less later examined portions of the animals' thyroids and anterior pituitaries histologically. The iodine content of the thyroids was also determined.

The amount of injected iodine fixed by the enlarged thyroids was in all groups greater than that fixed by the normal control thyroids, though before injection the iodine of the hyperplastic glands was less than that of the controls. According to the interpretation of Leblond and Mann, the histologic changes of the iodine-deficient gland result in a better utilization of iodine when iodine is available, and thus are beneficial to the animals. The thyroids of simple iodine deficiency and those of iodine deficiency plus the goitrogenic soybean diet, both retained more iodine than did the normal thyroids.

As the varying etiology of thyroid enlargement is studied, goiters of surgical proportions should become increasingly rare.

ESTROGENS AND METABOLISM

Vitamin requirements are increased by exercise and food consumption. According to Ashworth and Sutton,[2] of Chicago, symptoms of B-deficiency may be exaggerated by treatment of patients with estrogens. To determine the effects of estrogens in human B-deficiency, they administered the hormone to patients with several clinical deficiency conditions. Some of their patients were men. Lesions characteristic of thiamine deficiency (polyneuritis), nicotinic acid deficiency (pellagra), and riboflavin deficiency (cheilosis) could be induced in subclinical cases by treatment with estrogens. They conclude that the estrogens do not aid in utilization of the B complex.

Their patients were not persons who needed estrogens, but cases of B-deficiency, in which it was desired to study the effects of the ovarian follicle hormone. These would perhaps react differently from, for example, ovariectomized young women, in whom the hormone might have

1. Leblond, C. P.; and Mann, W.: Fixation of Iodine by Thyroids of Rats Given Diets Deficient in Iodine. Proc. Soc. Exper. Biol. & Med., **49**:102 (Jan.) 1942.

2. Ashworth, John; and Sutton, Don C.: Effect of Estrogen on the Utilization of the Vitamin B Complex. Arch. Int. Med., **69**:15 (Jan.) 1942.

an opposite effect, might increase utilization of a normal foodstuff.

The estrogens tend to increase the basal metabolic rate in life, and to increase the spontaneous activity. *In vitro* they increase the respiratory rate and oxygen consumption of isolated uterine tissue.[1] It would seem probable that they raise the vitamin requirement of animals and humans by spreading the utilization of oxygen and perhaps simultaneously of many other metabolic elements.

One may conclude that the diet should be investigated carefully in persons under estrogen therapy, and an adequate ration should be particularly assured when a stimulating hormone is prescribed.

TWENTY-FIVE YEARS AGO

From Journals of 1917

Prohibition Spree.[2]—News item from the Baltimore Sun: * * * "Danville, Virginia, February 23.—So great has become the demand here for a certain proprietary medicine which contains 25 per cent alcohol that the city police department has laid the condition before the prohibition commission. * * * During Saturday and Sunday, more than 700 bottles were sold in Danville and Schoolfield. The police had to deal with more drunkards this week than during the entire month of January and each man admitted that he became intoxicated on the medicine." * * * the name of the proprietary medicine responsible * * * was Hostetter's Bitters.

Food in England.[3]—The food controller has issued an appeal to the whole population asking people voluntarily to restrict their consumption of the three staple foods per week thus: bread 4 pounds; meat 2½ pounds; and sugar ¾ pound. * * * It is hoped that by loyal obedience, compulsory rationing which would require an elaborate machinery and absorb labor may be avoided.

Salvarsan Shortage.[4]—The indications are that the supply of salvarsan and neosalvarsan in this country has again reached the point of exhaustion. * * * Is our government impotent to relieve the condition? Congress made our patent law. * * * Monopolies on medicaments such as diphtheria antitoxin, salvarsan and the like are against public interest. * * * Again it should be emphasized that the fact that a most important drug is unavailable is the result of an act of Congress.

1. Carroll, W. R.: Influence of Estrogen on Respiration of Rat Uterine Tissue. Proc. Soc. Exper. Biol. & Med., **49**:50 (Jan.) 1942.

2. Editorial: Bone Dry but Still Moist. J.A.M.A., **68**:786, 1917.

3. London Letter: J.A.M.A., **68**:725, 1917.

4. Editorial: Another Shortage of Salvarsan. J.A.M.A., **68**: 785, 1917.

Correspondence

CREATINE IN URINE

Editor, Southern Medical Journal:

I wish to call attention to the fact that in your editorial "Creatine in Urine" published in the Southern Medical Journal, February, 1942, you have accidentally misquoted the article by Wilkins, Fleischmann and Howard (Bulletin Johns Hopkins Hospital, 66:493, December, 1941), and have led to the wrong interpretation of the significance of our findings. You state that methyl testosterone when given by mouth was followed by creatinuria which did not appear when the drug was given intramuscularly. Actually, we stated that methyl testosterone given orally uniformly caused increased excretion of creatine, whereas other workers did not observe creatinuria after the use of testosterone propionate intramuscularly. At the time of publication we had not had the opportunity to determine whether the difference in effect was due to the route of administration or the character of the drug. Subsequently we have found that methyl testosterone given intramuscularly produces as much creatinuria as when it is given orally. We have not observed creatinuria with testosterone propionate or certain other androgens which we have tested. It is therefore incorrect to use our results as an illustration of a difference due to the route of administration.

We would also like to call attention to the fact that the increased creatine excretion with methyl testosterone might be due to increased synthesis of the substance, while the creatinuria accompanying the muscular dystrophy of E-deficient rabbits studied by McCollum and McKenzie is probably due to leakage from the muscles.

Lawson Wilkins, M.D.
Johns Hopkins Hospital.

Baltimore, Maryland, February 11, 1942.

Book Reviews

Synopsis of Allergy. By Harry L. Alexander, A.B., M.D., Professor of Clinical Medicine, Washington University School of Medicine, St. Louis; Editor of the *Journal of Allergy*. 246 pages, illustrated. St. Louis: The C. V. Mosby Company, 1941. Cloth $3.00.

This small book contains a surprising amount of valuable information on the subject considering its 240 small pages. Its author, who is the Editor of the *Journal of Allergy*, is well versed in his subject and his opinions bear great weight among allergists.

The book contains a number of interesting and helpful charts and illustrations and a reference list which will lead to a wide field of information. It will be of interest to specialists on allergy and of especial interest to any physician wishing a short reference work on allergy. The whole book can be read in three to four hours.

BOOK REVIEWS continued on page 323

OFFICERS 1941-1942

The following is a complete roster of the officers of the Southern Medical Association for 1941-1942, and of associations meeting conjointly with the Southern Medical Association:

President—Dr. M. Pinson Neal, Columbia, Missouri.

President-Elect—Dr. Harvey F. Garrison, Jackson, Mississippi.

Vice-President—Dr. Joseph C. Peden, St. Louis, Missouri.

Secretary-Manager (Secretary, Treasurer and General Manager)—Mr. C. P. Loranz, Birmingham, Alabama.

Editor of Journal—Dr. M. Y. Dabney, Birmingham, Alabama.

Associate Editor of Journal—Mrs. Eugenia B. Dabney, Birmingham, Alabama.

Councilors—Dr. R. J. Wilkinson, Chairman, Huntington, West Virginia; Dr. E. W. Rucker, Jr., Birmingham, Alabama; Dr. S. J. Wolferman, Fort Smith, Arkansas; Dr. Oscar B. Hunter, Washington, D. C.; Dr. Walter C. Jones, Miami, Florida; Dr. Marion C. Pruitt, Atlanta, Georgia; Dr. E. L. Henderson, Louisville, Kentucky; Dr. Lucien A. LeDoux, New Orleans, Louisiana; Dr. W. Raymond McKenzie, Baltimore, Maryland; Dr. William H. Anderson, Booneville, Mississippi; Dr. Neil S. Moore, St. Louis, Missouri; Dr. William M. Coppridge, Durham, North Carolina; Dr. Robert M. Anderson, Shawnee, Oklahoma; Dr. J. Warren White, Greenville, South Carolina; Dr. Horton Casparis, Nashville, Tennessee; Dr. Curtice Rosser, Dallas, Texas; Dr. Thomas W. Murrell, Richmond, Virginia. Executive Committee: Dr. Henderson, Chairman; Dr. LeDoux and Dr. Hunter.

Board of Trustees (All are Past-Presidents)—Dr. Fred M. Hodges, Chairman, Richmond, Virginia; Dr. Frank K. Boland, Atlanta, Georgia; Dr. J. W. Jervey, Greenville, South Carolina; Dr. Walter E. Vest, Huntington, West Virginia; Dr. Arthur T. McCormack, Louisville, Kentucky; Dr. Paul H. Ringer, Asheville, North Carolina.

Section on General Practice—Dr. W. J. Lackey, Chairman, Fallston, North Carolina; Dr. W. L. Pressly, Vice-Chairman, Due West, South Carolina; Dr. B. A. Hopkins, Secretary, Stuart, Virginia.

Section on Medicine—Dr. Moise D. Levy, Chairman, Houston, Texas; Dr. Drew W. Luten, Vice-Chairman, St. Louis, Missouri; Dr. William H. Kelley, Secretary, Charleston, South Carolina.

Section on Gastroenterology—Dr. Donovan C. Browne, Chairman, New Orleans, Louisiana; Dr. Porter P. Vinson, Vice-Chairman, Richmond, Virginia; Dr. Julian M. Ruffin, Secretary, Durham, North Carolina.

Section on Neurology and Psychiatry—Dr. Guy F. Witt, Chairman, Dallas, Texas; Dr. Theodore A. Watters, Vice-Chairman, New Orleans, Louisiana; Dr. Cobb Pilcher, Secretary, Nashville, Tennessee.

Section on Pediatrics—Dr. George M. Lyon, Chairman, Huntington, West Virginia; Dr. J. B. Stone, Vice-Chairman, Richmond, Virginia; Dr. William Weston, Jr., Secretary, Columbia, South Carolina.

Section on Pathology—Dr. W. R. Mathews, Chairman, Shreveport, Louisiana; Dr. R. H. Rigdon, Vice-Chairman, Memphis, Tennessee; Dr. Robert A. Moore, Secretary, St. Louis, Missouri.

Section on Radiology—Dr. Charles H. Peterson, Chairman, Roanoke, Virginia; Dr. Lawther J. Whitehead, Vice-Chairman, Richmond, Virginia; Dr. Karl F. Kesmodel, Secretary, Birmingham, Alabama.

Section on Dermatology and Syphilology—Dr. M. T. Van Studdiford, Chairman, New Orleans, Louisiana; Dr. Garold V. Stryker, Vice-Chairman, St. Louis, Missouri; Dr. J. Lamar Callaway, Secretary, Durham, North Carolina.

Section on Allergy—Dr. C. Malone Stroud, Chairman, St. Louis, Missouri; Dr. Clarence K. Weil, Vice-Chairman, Montgomery, Alabama; Dr. L. O. Dutton, Secretary, El Paso, Texas.

Section on Physical Therapy—Dr. F. H. Ewerhardt, Chairman, St. Louis, Missouri; Dr. Euclid M. Smith, Vice-Chairman, Hot Springs National Park, Arkansas; Dr. Ben L. Boynton, Secretary, Norfolk, Virginia.

Section on Surgery—Dr. R. L. Sanders, Chairman, Memphis, Tennessee; Dr. Fred W. Bailey, Vice-Chairman, St. Louis, Missouri; Dr. J. A. Crisler, Jr., Secretary, Memphis, Tennessee.

Section on Bone and Joint Surgery—Dr. Guy W. Leadbetter, Chairman, Washington, D. C.; Dr. John D. Sherrill, Vice-Chairman, Birmingham, Alabama; Dr. Winthrop M. Phelps, Secretary, Baltimore, Maryland.

Section on Gynecology—Dr. W. O. Johnson, Chairman, Louisville, Kentucky; Dr. Willard M. Allen, Vice-Chairman, St. Louis, Missouri; Dr. John T. Sanders, Secretary, New Orleans, Louisiana.

Section on Obstetrics—Dr. Robert E. Seibels, Chairman, Columbia, South Carolina; Dr. R. A. White, Vice-Chairman, Asheville, North Carolina; Dr. Howard P. Hewitt, Secretary, Chattanooga, Tennessee

Section on Urology—Dr. J. Ullman Reaves, Chairman, Mobile, Alabama; Dr. Helmuth H. Kramolowsky, Vice-Chairman, St. Louis, Missouri; Dr. Austin I. Dodson, Secretary, Richmond, Virginia.

Section on Proctology—Dr. Raymond L. Murdoch, Chairman, Oklahoma City, Oklahoma; Dr. William J. Martin, Jr., Vice-Chairman, Louisville, Kentucky; Dr. W. K. McIntyre, Secretary, St. Louis, Missouri.

Section on Railway Surgery—Dr. Duncan Eve, Chairman, Nashville, Tennessee; Dr. Ross A. Woolsey,* Vice-Chairman and Secretary, St. Louis, Missouri.

Section on Ophthalmology and Otolaryngology—Dr. L. Chester McHenry, Chairman, Oklahoma City, Oklahoma; Dr. John H. Burleson, Chairman-Elect, San Antonio, Texas; Dr. W. Raymond McKenzie, Vice-Chairman, Baltimore, Maryland; Dr. J. W. Jervey, Jr., Secretary, Greenville, South Carolina.

Section on Anesthesia—Dr. Russell F. Bonham, Chairman, Houston, Texas; Dr. Merrill C. Beck, Vice-Chairman, New Orleans, Louisiana; Dr. John Adriani, Secretary, New Orleans, Louisiana.

Section on Medical Education and Hospital Training—Dr. Lee E. Sutton, Jr., Chairman, Richmond, Virginia; Dr. Charles H. Neilson, Vice-Chairman, St. Louis, Missouri; Dr. John W. Spies, Secretary, Galveston, Texas.

Section on Public Health—Dr. I. C. Riggin, Chairman, Richmond, Virginia; Dr. R. E. Fox, Vice-Chairman, Raleigh, North Carolina; Dr. Hugh R. Leavell, Secretary, Louisville, Kentucky.

American Public Health Association, Southern Branch (meeting conjointly with Southern Medical Association)—Dr. P. E. Blackerby, President, Louisville, Kentucky; Dr. Douglas L. Cannon, First Vice-President, Montgomery, Alabama; Mrs. Ruth George, Second Vice-President, Columbia, South Carolina; Mr. L. M. Clarkson, Third Vice-President, Atlanta, Georgia; Dr. R. H. Hutcheson, Secretary-Treasurer, Nashville, Tennessee. *Public Health Nursing Section*—Miss Ella Mae Hott, Chairman, Jefferson City, Missouri; Miss O'Connor George, Vice-Chairman, Jackson, Mississippi; Miss Pearl Barclay, Secretary, Montgomery, Alabama. *Sanitary Engineers' and Sanitation Officers' Section*—Mr. C. Heard Field, Chairman, Savannah, Georgia; Mr. R. E. Dorer, Vice-Chairman, Norfolk, Virginia; Mr. J. L. Robertson, Jr., Secretary-Treasurer, Memphis, Tennessee.

National Malaria Society (meeting conjointly with Southern Medical Association)—Dr. L. O. Howard, Honorary President, Washington, D. C.; Mr. John H. O'Neill, President, New Orleans, Louisiana; Col. J. S. Simmons, President-Elect, Washington, D. C.; Dr. H. W. Brown, Vice-President, Chapel Hill, North Carolina; Dr. Mark F. Boyd, Secretary-Treasurer, Tallahassee, Florida.

American Society of Tropical Medicine (meeting conjointly with Southern Medical Association)—Dr. Ernest Carroll Faust, President, New Orleans, Louisiana; Dr. N. Paul Hudson, President-Elect, Columbus, Ohio; Dr. Joseph S. D'Antoni, Vice-President, New Orleans, Louisiana; Dr. E. Harold Hinman, Secretary-Treasurer, Wilson Dam, Alabama; Col. Charles F. Craig, Editor, San Antonio, Texas. *American Academy of Tropical Medicine* (meeting conjointly with American Society of Tropical Medicine)—Dr. Herbert C. Clark, President, Panama, R. de P.; Dr. L. W. Hackett, Vice-President, Buenos Aires, Argentina; Dr. Ernest Carroll Faust, Secretary, New Orleans, Louisiana; Dr. Thomas T. Mackie, Treasurer, New York, New York.

Women Physicians of the Southern Medical Association—Dr. Grace Scholz Mountjoy, Chairman, St. Louis, Missouri.

Woman's Auxiliary to the Southern Medical Association—Mrs. J. Ullman Reaves, President, Mobile, Alabama; Mrs. Richard H. Clark, President-Elect, Hattiesburg, Mississippi; Mrs. John Pierpont Helmick, First Vice-President, Fairmont, West Virginia; Mrs. Martin J. Glaser, Second Vice-President, St. Louis, Missouri; Mrs. L. S. Thompson, Recording Secretary, Dallas, Texas; Mrs. L. W. Roe, Corresponding Secretary, Mobile, Alabama; Mrs. Olin S. Cofer, Treasurer, Atlanta, Georgia; Mrs. Joseph E. Wier, Historian, Louisville, Kentucky; Mrs. W. W. Potter, Parliamentarian, Concord, Tennessee.

*Deceased.

Book Reviews

Continued from page 321

Synopsis of the Preparation and Aftercare of Surgical Patients. By Hugh C. Ilgenfritz, A.B., M.D., Instructor in Surgery, Louisiana State University School of Medicine, New Orleans, and Rawley M. Penick, Jr., Ph.B., M.D., F.A.C.S., Professor of Clinical Surgery, Louisiana State University School of Medicine, New Orleans. With Foreword by Urban Maes, M.D., D.Sc., F.A.C.S., Professor of Surgery and Director of the Department, Louisiana State University School of Medicine. 532 pages, illustrated. St. Louis: The C. V. Mosby Co., 1941. Cloth $5.00.

Most volumes or systems of surgery devote most of their space to surgical diseases, their recognition, therapy with a variety of surgical technics and results; featuring, as it were, the diseases and not the patient. The lack of space affords a rather brief discussion of preparation, postoperative care, and treatment of complications of the surgical patients. This book well fills a need.

General condition of the surgical patients, shock, fluid and electrolyte balance, extremities of age, obesity, anemias, vitamin deficiencies, heart disease, kidney disease, and the diabetic are adequately discussed with relation to general surgery.

Most interesting are the chapters discussing prevention and treatment of thrombophlebitis, of intestinal obstruction and general peritonitis. All of these are brought up to date and contain not only the authors' opinion and experience, but also the opinion and experience of recognized workers in each particular field.

Only the care of general surgical patients is presented. No attention is given to urology, gynecology, osteology or other surgical specialties.

The Blood Bank and the Technique and Therapeutics of Transfusions. By Robert A. Kilduffe, A.B., A.M., M.D., F.A.C.P., Director, Laboratories, Atlantic City Hospital, and Michael DeBakey, B.S., M.D., M.S., F.A.C.S,, Assistant Professor of Surgery, School of Medicine, Tulane University of Louisiana. 558 pages, illustrated. St. Louis: The C. V. Mosby Company, 1942.

This volume appears at an opportune time. The present greatly aroused interest in transfusion is due, in large measure, to war activities, but it must not be forgotten that in civil life the indications for transfusion have been enormously broadened as the wide range of its therapeutic value has been demonstrated.

The authors, one a distinguished bacteriologist and serologist, the other an outstanding and ingenious experimental and clinical surgeon, have been able, in their respective spheres, to present with utmost clarity the problems which surround this subject.

They discuss first history, indications and contraindications, military aspects, special types of transfusion, the technic of blood typing and compatability tests, the nature, causes and detection of anomalous reactions and methods for their elimination.

The dangers of employing universal donors are explained and warnings are given against the unchecked use of these donors.

The blood bank, the changes which occur in stored blood, the operation of a blood bank, and plasma transfusion are discussed.

The preparation and preservation of citrated plasma and the preparation of concentrated and dried plasma are covered.

Methods, technic and complications of transfusion are described.

Every chapter goes into the greatest detail in treating the subject under discussion and a voluminous bibliography is appended.

The book is handsomely bound, well illustrated, and the print is excellent.

MacLeod's Physiology in Modern Medicine. Edited by Philip Bard, Professor of Physiology, Johns Hopkins University School of Medicine. Ninth Edition. 1256 pages, illustrated. St. Louis: The C. V. Mosby Company, 1941. Cloth $10.00.

MacLeod's Physiology in Modern Medicine in its ninth (1941) edition has been largely rewritten by a distinguished group of scientists to bring to the student insofar as possible the most recent additions in the rapidly changing knowledge in this fundamental field of basic medical science. Chapters on the closely bordering fields of physiologic chemistry and pharmacology have been arranged in their proper relative positions. The general plan and purposes of the book and the collaborators in the publication of the eighth edition have been retained and they have been joined by Howard J. Curtis, who has rewritten the chapters on electrical excitation and conduction of the nerve impulse, and by Walter S. Root, who has contributed a chapter on the urinary bladder. The bibliography and index have been improved and many new figures introduced. Altogether it is a most excellent textbook for the undergraduate student and the practitioner as well. The use of a non-glare paper and excellent typography contribute to the comfort of its study.

The Care of the Aged (Geriatrics). By Malford W. Thewlis, M.D., Attending Specialist, General Medicine, United States Public Health Hospitals, New York City. Third Edition. 579 pages, illustrated. St. Louis: The C. V. Mosby Company, 1941. Cloth $6.00.

This book is complete enough to fill the needs of the specialist, the internist, the general practitioner, and the general surgeon who seek guidance in the appraisal of the organs of the aged, preparation for surgery, and in postoperative care. Wide varieties of lesions and diseases are presented.

Hygiene of the senescent, prevention of premature senility, occupational necessities, hobbies, rest, sleep and nutritional requirements of the aged are important subjects adequately discussed. Anatomical and physiologic changes of all the organs characteristic of the aged are described. Recognition and differentiation of degenerative processes from progressive disease are emphasized. Arteriosclerosis, so long considered an aging process, is presented and discussed as a progressive disease. Much space is given to the presentation of cardiovascular, respiratory, digestive, and urological disorders together with their care and treatment.

Infectious diseases, allergy, alcoholism and endocrine disorders are discussed from the standpoint of pathogenesis, diagnosis and treatment. The author believes

that many senile changes are expressions of endocrine disorders. He notes that an adolescent with Simmond's disease has much the same appearance as an aged person. He condemns the frequent surgical neglect of the aged and points out that age itself is not a contraindication to surgery, but rather the complications of age. In the surgery of the aged he emphasizes pre- and postoperative care, skilful handling of tissues, and the choice of a suitable anesthetic.

Treatment of the Patient Past Fifty. By Ernst P. Boas, M.D., Associate Physician, Mount Sinai Hospital, New York City. 320 pages, illustrated. Chicago: The Year Book Publishers, Inc., 1941. Cloth $4.00.

This is a dependable guide to the practitioner in the care of his ever-increasing number of aged patients. It was not written for the specialist, for many diseases of the aged are not discussed, but rather emphasis is upon cardiovascular disease, cardiac and cerebral vascular accidents, chronic pulmonary disease such as emphysema, fibrosis and bronchiectasis.

Differentiation of the manifestations of disease and of involutional processes is very well accomplished. In the chapter on general management detailed requirements of the aged in senescence are emphasized in regard to occupation, rest, diet, exercise and sleep.

The emphasis of this valuable book is on chronic disease rather than the acute, on management and care of the aged, and on treatment from the standpoint of prevention and arrest of disease.

A Textbook of Bacteriology. By R. W. Fairbrother, D.Sc., M.D., M.R.C.P., Director of the Clinical Laboratory, Manchester Royal Infirmary. Third Edition. 451 pages, illustrated. St. Louis: The C. V. Mosby Company, 1941. Cloth $5.00.

Here is a textbook of bacteriology in which the application of bacteriology to the medical sciences is especially emphasized and not the preparation of a specialist in bacteriology. The fundamental principles of bacteriology in relation to medicine and public health are presented accurately. While primarily intended for the student of medicine, the size of the book and the material covered are such that it has been found adaptable for use by undergraduate students in bacteriology, dentistry and nursing.

The print is easily read and the illustrations and tables are excellent. This volume will fill the needs of those who desire a brief yet adequate textbook of bacteriology.

Lymphatics, Lymph and Lymphoid Tissue. By Cecil Kent Drinker, Professor of Physiology, School of Public Health, Harvard University, and Joseph Mendel Yoffey, M.Sc., M.D., F.R.C.S. (Eng.). 406 pages, illustrated. Cambridge, Massachusetts: Harvard University Press, 1941. Cloth $4.00.

In this book one finds a detailed discussion of the whole lymphatic apparatus as the experience of the authors has related it to function in the mammal. It is a contribution to knowledge of the physiology of the lymphatics and the structural and functional significance of the lymphoid tissue. Literature has been cited where pertinent without any claim to completeness of bibliography. The reader may extend his reading on the subject as he chooses.

The authors begin with a description of the anatomical and physiologic organization of the lymphatic system. They then discuss the permeability of blood capillaries and its relation to the lymph formation; the permeability of lymphatics; lymph flow and pressure; the clinical composition and physical characteristics of lymph; the biological significance of lymphoid tissue; the cell content of lymph; and the significance of the lymphocyte. In conclusion there is a chapter devoted to clinical problems involving the lymphatic system.

The illustrations are excellent and well arranged. The text is clearly printed and easily read. This monograph can be heartily recommended.

Southern Medical News

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

The American Association of Obstetricians, Gynecologists and Abdominal Surgeons is offering an award of $150, known as the Foundation Prize, for a thesis by a physician, intern, resident or graduate student specializing in this field. All manuscripts must be limited to 5,000 words and must be in the hands of the Secretary, Dr. James R. Bloss, 418 Eleventh Street, Huntington, West Virginia, before June 1, 1942.

ALABAMA

State Division of Industrial Hygiene will be moved from Montgomery to Birmingham with space in the City Hall Building because Birmingham is the most logical center of industrial activity and because of demands in connection with the defense program. Dr. Edwin H. Place, Montgomery, is in charge of the Division.

Dr. Ralph L. Best, Drumright, Oklahoma, has been made Health Officer of Greene County with headquarters in Eutaw.

Dr. Corinne S. Eddy, Centerville, has been appointed Health Officer for Bibb County. She was formerly connected with the unit in Cleburne County.

Dr. Paul Nickerson, Sylacauga, and Mrs. Rachel Johns Nickerson were married recently.

Deaths

Dr. John Crawford Burkhalter, Titus, aged 72, died recently of coronary occlusion.

ARKANSAS

Ashley County Medical Society has elected Dr. G. W. Fletcher, Montrose, President, and Dr. C. S. Pool, Secretary-Treasurer.

Bradley County Medical Society has elected Dr. W. N. Roark, Hermitage, President; Dr. Rufus Martin, Warren, Vice-President; and Dr. R. F. Hoffman, Warren, Secretary-Treasurer.

Chicot County Medical Society has elected Dr. W. A. Craig, Eudora, President; Dr. E. Baker, Dermott, Vice-President; and Dr. W. J. Schwarz, Lake Village, Secretary-Treasurer.

Clark County Medical Society has elected Dr. H. A. Ross, President, and Dr. Joe W. Reid, Secretary-Treasurer, both of Arkadelphia.

Crawford County Medical Society has elected Dr. B. B. Bruce, Alma, President; Dr. J. R. Crigler, Alma, Vice-President; and Dr. S. D. Kirkland, Van Buren, Secretary-Treasurer.

Columbia County Medical Society has elected Dr. H. K. Car-

Continued on page 40

Constipation in Infancy

Constipation in infancy probably commands the physician's attention more often than any other symptom that points to the need of readjusting a feeding formula.

Constipation is a common complaint and oftentimes is the real reason for a slow gain in weight, restless nights and a fretful, uncomfortable baby.

Infants fed on milk and water in proportions suitable for healthy babies of given age and weight with an amount of Mellin's Food to meet the carbohydrate requirement (*six to eight level tablespoons to the full day's mixture*) are seldom constipated.

Many physicians use Mellin's Food routinely in preparing bottle feedings, for they know from experience that regular stools of good consistency are characteristic of babies fed on milk properly modified with Mellin's Food. These physicians thus avoid much of the trouble associated with infant feeding.

Mellin's Food Co., Boston, Mass.

MELLIN'S FOOD: Produced by an infusion of Wheat Flour, Wheat Bran and Malted Barley admixed with Potassium Bicarbonate—consisting essentially of Maltose, Dextrins, Proteins and Mineral Salts.

Laxatives

not needed to relieve

Constipation

when the daily feedings are prepared from milk properly modified with

Mellin's Food

Samples sent to physicians upon request.

Continued from page 324

rington, President; Dr. P. M. Smith, Vice-President; and Dr. J. H. Wilson, Secretary-Treasurer, all of Magnolia.

Desha County Medical Society has elected Dr. R. F. White, McGehee, President, and Dr. Gibbs Biscoe, Dumas, Secretary-Treasurer.

Franklin County Medical Society has elected Dr. W. C. Porter, President; Dr. E. W. Pillstrom, Vice-President; and Dr. W. H. Gibbons, Secretary-Treasurer, all of Ozark.

Garland County Medical Society has elected Dr. Louis G. Martin, President; Dr. F. S. Tarleton, Vice-President; and Dr. W. E. Gray, Secretary-Treasurer, all of Hot Springs National Park.

Hempstead County Medical Society has elected Dr. J. E. Gentry, McCaskill, President; Dr. J. G. Martindale, Hope, Vice-President; and Dr. Jim McKenzie, Hope, Secretary-Treasurer.

Hot Springs County Medical Society has elected Dr. M. D. Prickett, Malvern, President; Dr. R. V. McCray, Malvern, Vice-President; and Dr. B. T. Kolb, Secretary-Treasurer.

Johnson County Medical Society has elected Dr. Guy Shrigley, President; Dr. R. H. Johnston, Clarksville, Vice-President; and Dr. G. R. Siegel, Clarksville, Secretary-Treasurer.

Lawrence County Medical Society has elected Dr. H. B. Hull, Mammoth Spring, President; Dr. C. C. Townsend, Walnut Ridge, Vice-President; and Dr. Chas. D. Tibbels, Black Rock, Secretary-Treasurer.

Lincoln County Medical Society has elected Dr. C. W. Dixon, Gould, President; Dr. G. W. Ringgold, Gould, Vice-President; and Dr. L. T. Taylor, Star City, Secretary-Treasurer.

Little River County Medical Society has elected Dr. E. R. King, President, and Dr. J. W. Ringgold, Secretary-Treasurer, both of Ashdown.

Madison County Medical Society has elected Dr. N. J. Hill, Huntsville, President; Dr. G. D. Counts, Wesley, Vice-President; and Dr. Fred Youngblood, Huntsville, Secretary-Treasurer.

Nevada County Medical Society has elected Dr. L. J. Harrell, Prescott, President; Dr. C. A. Archer, Jr., Vice-President; and Dr. J. W. Kennedy, Secretary-Treasurer.

Phillips County Medical Society has elected Dr. A. W. Cox, Helena, President; Dr. Joe W. King, Memphis, Tennessee, Vice-President; and Dr. H. H. Rightor, Helena, Secretary-Treasurer.

Prairie County Medical Society has elected Dr. J. R. Lynn, Hazen, President; Dr. Edward Adams, DeValls Bluff, President-Elect; and Dr. J. C. Gilliam, Des Arc, Secretary-Treasurer.

Polk County Medical Society has elected Dr. B. H. Hawkins, President; Dr. H. G. Heller, Vice-President; and Dr. J. G. Hilton, Secretary-Treasurer, all of Mena.

Searcy County Medical Society has elected Dr. E. W. Wood, President; Dr. J. O. Leslie, Vice-President; and Dr. Sam G. Daniel, Secretary-Treasurer, all of Marshall.

Sevier County Medical Society has elected Dr. J. S. Hendricks, President; Dr. C. A. Archer, Vice-President; and Dr. C. E. Kitchens, Secretary-Treasurer, all of DeQueen.

Washington County Medical Society has elected Dr. W. J. Butt, President; Dr. Chas. S. Paddock, Vice-President; and Dr. V. O. Lesh, Fayetteville, Secretary-Treasurer.

White County Medical Society has elected Dr. M. C. Hawkins, Jr., President; Dr. A. J. Dunklin, Vice-President; and Dr. Sam J. Allbright, Secretary-Treasurer, all of Searcy.

The Federal government has recently approved a $90,000 grant to assist in a $200,000 expansion program for the St. Edward's Mercy Hospital at Fort Smith.

Dr. Euclid M. Smith, Hot Springs National Park, has been elected a life member of the Alumni Association of the University of Arkansas.

Dr. J. H. Wilson has been appointed Health Officer for Columbia.

Saint Vincent's Infirmary, Little Rock, has elected Dr. S. C. Fulmer, Chief of Staff; Dr. Clyde D. Rodgers, Vice-Chief; Dr. C. A. Rosenbaum, Secretary; Dr. George Lewis, Chief of Surgery; Dr. J. N. Compton, Chief of Medicine; and Dr. E. H. White, Chief of Obstetrics.

Arkansas State Board of Health has elected Dr. T. H. Wilson, Wynne, President; Dr. W. G. Hodges, Malvern, Vice-President; and Dr. W. B. Grayson, Little Rock, Secretary.

Dr. Henry G. Hollenberg, Little Rock, has been appointed Chief Surgeon to the McRae Memorial Sanatorium during the absence of Dr. Harvey Shipp, on duty with the Naval Reserve Corps.

Dr. J. O. Boydstone, Hot Springs National Park, has been promoted to Major, Medical Corps, U. S. Army, and is now assigned at Camp Polk, Louisiana.

Dr. Wm. B. Connolly, Helena, has been assigned to duty as First Lieutenant, Medical Detachment, 153rd Infantry, Fort Raymond, Seward, Alaska.

Dr. M. K. Bottorff has been relieved from Army service and has returned to Lake Village for practice.

Dr. Ellis Gardner has become associated with Dr. L. Gardner at Russellville.

Dr. B. T. Kolb and Dr. Agnes C. Kolb have moved from Donaldson to Malvern.

Dr. A. F. Hoge has been elected a Director of the City National Bank at Fort Smith.

Dr. J. S. Coffman has been elected a Director of the Citizens Bank at Lavaca.

Dr. P. E. Hendrix, President of the Horatio State Bank for thirty-seven years, has been elected Honorary President.

Dr. J. W. Brown has been elected a Director of the Bank of Pocahontas.

Dr. E. F. Ellis has been elected a Director of the First National Bank of Fayetteville.

Dr. E. D. McKnight has been elected a Director of the Bank of Brinkley.

Dr. A. M. Elton has been elected a Director of the First National Bank of Newport.

Dr. O. R. Kelly has been elected a Director of the Grant County Bank at Sheridan.

Dr. M. Y. Pope has been elected a Director of the Union Bank and Trust Company at Magnolia.

Dr. Joe F. Rushton has been elected a Director of the Citizens Bank at Magnolia.

Dr. R. O. Norris has been elected a Director of the Bank of Tuckerman.

Dr. B. L. Wage has been elected Vice-President of the Farmers' Bank at Greenwood.

Dr. I. R. Johnson has been elected Vice-President of the Farmers' Bank and Trust Company at Blytheville.

Dr. G. F. McLeod has been elected Chief of Staff of the City Hospital at Magnolia.

Deaths

Dr. Robert Wakeman Cupp, Marmaduke, aged 58, died January 17.

Continued on page 42

DR. MOODY'S SANITARIUM

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1. Pour 1 envelope of plain, unflavored Knox Gelatine into a glass about ½ filled with water or fruit juice, not iced.

2. Let the liquid absorb the gelatine. Then stir briskly.

3. Drink immediately. If the gelatine thickens, add a little more liquid and stir again. Knox is tasteless, odorless.

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All protein, no sugar

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NAME _____

ADDRESS _____

Continued from page 40

Dr. Clinton Amos Hardesty, Paragould, aged 65, died January 10.

Dr. Ernest H. Harris, Coy, aged 61, died January 15.

Dr. John R. Keathley, Griffithville, aged 77, died recently.

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Address, Mabel R. Stewart, Registrar of the School, 218 Second Ave., New York City

DISTRICT OF COLUMBIA

An Interprofessional Conference has been organized under the auspices of the Medical Society of the District of Columbia to bring together representatives of related professional groups for consideration of mutual problems concerning preservation of civilian health in Washington during the war emergency. The officers are: Dr. Robert Lomax Wells, Chairman; Dr. Valentine M. Hess, Vice-Chairman; and Mr. Theodore Wiprud, Secretary of the District Medical Society, Secretary, all of Washington.

Medical Society of the District of Columbia has approved a project whereby periodic health examinations will be available to the District general population at a set fee of $5.00 and incorporated the program as a permanent and integral part of the Society's activities.

Medical and Surgical Staff of the Episcopal Eye, Ear and Throat Hospital, Washington, has elected Dr. Claude Moore, Chairman; Dr. Frazier Williams, Vice-Chairman; and Dr. P. J. Gurwin, Secretary.

Dr. George W. Creswell, Washington, has received an appointment as Special Consultant in the Public Health Service, Division of Venereal Diseases.

Dr. Lewis R. Thompson, Washington, Director of the National Institute of Health and Assistant Surgeon General in charge of scientific research, has been appointed Chief Inspecting Officer of the U. S. Public Health Service, a new position established in the office of the Surgeon General. Dr. Rolla E. Dyer, Washington, has been named to succeed Dr. Thompson as Assistant Surgeon General in charge of the Division of Scientific Research and as Director of the National Institute of Health.

Dr. Edward J. Stieglitz announces the opening of his office at 1726 Eye Street, Northwest, Washington, practice limited to internal medicine.

Dr. Joseph F. Siler, Washington, was elected President of the Gorgas Memorial Institute of Tropical and Preventive Medicine, Incorporated, at its recent annual meeting in Washington, and Dr. Merritte W. Ireland, Washington, was elected Secretary.

Dr. William James Collins, Washington, and Miss Catherine C. Doran were married recently.

Deaths

Dr. Virginius Dabney, Washington, aged 63, died January 18.

Dr. Loren Bascom Taber Johnson, Washington, aged 66, died recently of carcinoma of the stomach.

Dr. Charles Clagett Marbury, Washington, aged 71, died recently of coronary thrombosis.

Dr. Stephen Aloysius Yesko, Washington, aged 45, died recently of gastric hemorrhage.

Dr. George Walter Warren, Washington, aged 78, died recently of pneumonia.

FLORIDA

Alachua County Medical Society has elected Dr. J. L. Summerlin, President, reelected; Dr. G. C. Tillman, President-Elect; and Dr. A. T. Cobb, Secretary-Treasurer, all of Gainesville.

Duval County Medical Society has installed Dr. Ernest B. Milam, President, and elected Dr. T. Z. Cason, President-Elect; Dr. Karl B. Hanson, Vice-President; Dr. Frank G. Slaughter, Secretary; and Dr. John A. Beals, Treasurer, all of Jacksonville.

Escambia County Medical Society has elected Dr. A. L. Stebbins, Pensacola, President; Dr. M. W. Dodson, Pensacola, Vice-President; and Dr. W. S. Randall, Secretary-Treasurer, reelected.

Hillsborough County Medical Society has elected Dr. Blackburn W. Lowry, Tampa, President; Dr. T. C. Maguire, Plant City, Vice-President; and Dr. James S. Grable, Tampa, Secretary-Treasurer.

Jackson County Medical Society has elected Dr. W. R. Wandeck, Marianna, President; Dr. C. H. Ryals, Grand Ridge, Vice-President; and Dr. R. N. Joyner, Marianna, Secretary-Treasurer.

Pasco-Hernando-Citrus County Medical Society has elected Dr. J. T. Bradshaw, San Antonio, President; Dr. H. Durham Young, Bushnell, First Vice-President; Dr. C. L. Carter, Inverness, Second Vice-President; and Dr. G. R. Creekmore, Brooksville, Secretary-Treasurer.

Florida Public Health Association, at its last annual meeting, elected Dr. William H. Pickett, Jacksonville, President; Dr. Leland H. Dame, Sebring, and Dr. Katherine L. Corbin, Jacksonville, Vice-Presidents; and Dr. Lord N. Harlow, Jacksonville, Secretary-Treasurer. This year's meeting will be held in Miami.

Dr. George M. Dawson, West Palm Beach, has been doing postgraduate work at the Cook County Hospital, Chicago.

Dr. Marvin Smith announces the removal of his offices from the Huntington Building to his new Clinic Building at 800 South-

Continued on page 44

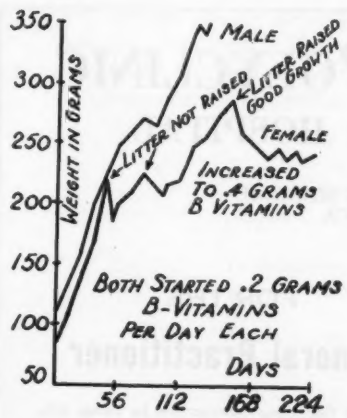
A VITAMIN PROPHESY

During the time of the Caesars, Martellus Bromaeus, on taking charge of the Roman Military Surgeons' Academy, said:

"Do not assume for one single moment that we know all and everything about the human body and its functions. In fact, we know very little, and we have to keep searching without cessation for new scientific facts. I can tell you right here that the human body can not get along without an abundance of the substances which are so richly found in nature and probably some others which we might not be able to see or guess. A time will come when these mysterious substances will be known to physicians so that they can be put to their best therapeutic use."—A. Kronfeld, "History of Medicine."

With all the brilliant work to separate "vitamin B" into the heat affected B_1 and heat resisting B_2, and then into some of their parts—thiamin, riboflavin, nicotinic acid, pantothenic acid, pyridoxine—all in the vitamin B complex has not yet been separated.

Dried grain grown brewers' yeast remains the standard for the whole vitamin B complex, both in laboratory research and in medicine where the physician or scientist wants to be sure.



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The biological feeding test shown in the chart was made with Vitafood Dried Brewers' Yeast. Note that more of the B vitamins are needed for raising the litter.

Samples for clinical or professional use will be sent on request, including the yeast in tablet form.

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Continued from page 42

west Nineteenth Avenue, Miami, the clinic providing facilities for the diagnosis and treatment of gastro-intestinal and rectal diseases.

Dr. Robert E. Blount, Fort Lauderdale, and Miss Mary Allen Hooper, Howiston, Virginia, were married recently.

Dr. L. W. Dowlen and Miss Marie Louise Smith, both of Miami, were married recently.

Dr. Bert H. Malone, Jacksonville, and Miss Violet Adelaide Glascock, Waycross, Georgia, were married recently.

Deaths

Dr. Kenneth R. Bell, Sanford, aged 30, died recently.

Dr. Peter Price Denton, Daytona Beach, aged 75, died recently.

Dr. William Thomas Middlebrooks, Panama City, aged 78, died recently.

Dr. John H. Mills, Tampa, aged 71, died recently.

Dr. B. E. Miller, New Smyrna Beach, aged 71, died recently.

GEORGIA

Carroll County Medical Society has elected Dr. B. C. Powell, Villa Rica, President; Dr. H. L. Barker, Carrollton, Vice-President; and Dr. D. S. Reese, Carrollton, Secretary-Treasurer.

Cherokee-Pickens Counties Medical Society has elected Dr. Charles R. Andrews, President; Dr. J. T. Pettit, Vice-President; and Dr. Robert T. Jones, Secretary-Treasurer, all of Canton.

Clarke-Madison-Oconee Counties Medical Society has elected Dr. H. B. Harris, President; Dr. W. H. Cabanis, Vice-President; and Dr. Loree Florence, Secretary-Treasurer, all of Athens.

Cobb County Medical Society has elected Dr. F. P. Lindley, Powder Springs, President; Dr. R. W. Fowler, Marietta, Vice-President; and Dr. M. N. McCall, Jr., Acworth, Secretary-Treasurer.

Douglas County Medical Society has elected Dr. T. B. Taylor, President; Dr. C. V. Vansant, Secretary; and Dr. R. E. Hamilton, Treasurer, all of Douglasville.

Floyd County Medical Society has elected Dr. Lester Harbin, President; Dr. Warren M. Gilbert, President-Elect; and Dr. Chas. I. Harris, Jr., Secretary-Treasurer, all of Rome.

Glynn County Medical Society has elected Dr. T. V. Willis, President; Dr. M. E. Winchester, Vice-President; and Dr. T. W. Collier, Secretary-Treasurer, all of Brunswick.

Gordon County Medical Society has elected Dr. M. A. Acree, President; Dr. J. E. Billings, Vice-President; and Dr. R. D. Walter, Secretary-Treasurer, all of Calhoun.

Randolph-Terrell Counties Medical Society has elected Dr. S. P. Kenyon, Dawson, President; Dr. L. R. Massengale, Lumpkin, Vice-President; and Dr. W. G. Elliott, Cuthbert, Secretary-Treasurer.

Spalding County Medical Society has elected Dr. H. W. Copeland, President; Dr. A. H. Frye, Vice-President; and Dr. T. F. Floyd, Secretary-Treasurer, all of Griffin.

Tift County Medical Society has elected Dr. R. E. Jones, President; Dr. E. L. Evans, Vice-President; and Dr. A. G. LeRoy, Secretary-Treasurer, all of Tifton.

Ware County Medical Society has elected Dr. Jos. R. Gay, Homerville, President; Dr. Braswell E. Collins, Waycross, Vice-President; and Dr. Kenneth McCullough, Waycross, Secretary-Treasurer.

Wilkes County Medical Society has elected Dr. A. W. Simpson, President; Dr. L. R. Casteel, Vice-President; and Dr. Robert G. Stephens, Secretary-Treasurer, all of Washington.

Walker-Catoosa-Dade Counties Medical Society has elected Dr. Fred H. Simonton, Chickamauga, President; Dr. C. W. Stephenson, Ringgold, Vice-President; and Dr. Paul M. Golley, LaFayette, Secretary-Treasurer.

Piedmont Hospital, Atlanta, has elected Dr. Wm. H. Trimble, President of the Medical Staff; Dr. B. Russell Burke, Vice-President; and Dr. Sterling Claiborne, Secretary-Treasurer.

St. Joseph Hospital, Savannah, has elected Dr. E. J. Whelan, President and Chief of Staff; Dr. Henry C. Frech, Vice-President; and Dr. L. M. Freedman, Secretary.

Dr. O. R. Styles, who has practiced for twenty-one years at Bowdon, has moved to Cedartown to continue practice.

Dr. A. Ralph Marsicano has moved from Collidge to Douglas and will serve as Coffee County Commissioner of Health.

Continued on page 46

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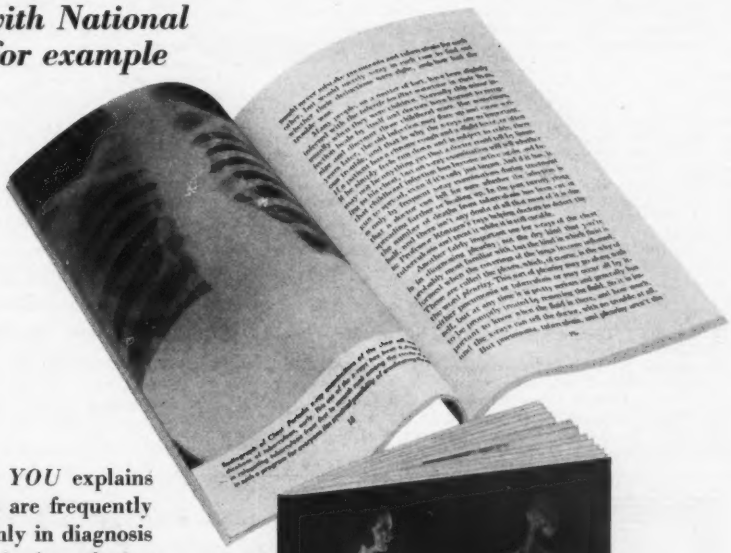

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Continued from page 44

Dr. Harold W. Long, formerly of Milledgeville, is now associated in practice with Dr. J. Cox Wall at Eastman.

DEATHS

Dr. Thomas Sargent Bailey, Newnan, aged 66, died recently.
Dr. Frank West Coile, Winterville, aged 77, died recently.
Dr. Alexander Dawson, Atlanta, aged 76, died recently.
Dr. John Hill Hammond, LaFayette, aged 85, died recently.
Dr. Samuel Cathcart Ketchin, Louisville, aged 50, died recently.
Dr. Charles Van Wood, Cedartown, aged 66, died recently.
Dr. Alexander Marion Moore, Athens, aged 56, died recently.

KENTUCKY

Dr. Fred Rankin, Lexington, has been called to active duty in the office of the Surgeon General of the U. S. Army with the rank of Colonel. He assumed active duty March 1, serving as Consulting Surgeon.

Daviess County Medical Society has elected Dr. Horace Harrison, President, and Dr. Thomas H. Milton, Secretary-Treasurer, both of Owensboro.

Union County Medico-Dental Society has elected Dr. G. B. Carr, Sturgis, President; Dr. Darrel Vaughn, Vice-President; and Dr. Bruce Underwood, Evarts, Secretary.

DEATHS

Dr. William L. Elmore, Versailles, aged 84, died recently.

Dr. Thomas J. Edge, Graham, aged 60, died recently of coronary occlusion.

Dr. William W. Heuser, Louisville, aged 70, died January 10 of a fractured skull suffered when he fell at his home.

Dr. John W. Kremer, Louisville, aged 72, died January 1.

Dr. Hugh McCullough, Louisville, aged 83, died recently.

Dr. Austin E. Popham, Louisville, aged 62, died recently of cerebral hemorrhage and hypertension.

Dr. Joseph James Shafer, Louisville, aged 70, died January 4 of pneumonia.

LOUISIANA

Louisiana Public Health Association has elected Dr. Ford J. A. MacPherson, Baton Rouge, President, and Dr. Reuben A. Brown, New Orleans, Secretary-Treasurer.

A portrait of the late Dr. John Smythe, Professor of Clinical Surgery, Tulane University of Louisiana School of Medicine, New Orleans, was unveiled recently in the Hotel Dieu Library, which he established, the picture being a gift of the widow of the physician. Dr. Smythe was Visiting Physician at Hotel Dieu for more than thirty years.

Dr. John H. Musser, Professor of Medicine, Tulane University of Louisiana School of Medicine, New Orleans, has resigned as President of the State Board of Health because his full-time service is required at the Tulane University Medical School. Dr. Christopher L. Mengis, New Iberia, has been appointed President; Dr. Robert H. Onstott, New Orleans, is Executive Officer of the Board; and Dr. Ford S. Williams, New Orleans, is Assistant State Health Officer.

Dr. R. L. DeBuys, New Orleans, was recently elected President of the New Orleans Golf Association.

Dr. T. A. Watters, New Orleans, was elected Vice-President of the Alumni Association of the Neurological Institute of New York at the recent annual meeting held in New York City.

Dr. Ford S. Williams, New Orleans, and Miss Anna Ella Fugate, Hazlehurst, were married recently.

DEATHS

Dr. Frank J. Chalaron, New Orleans, aged 73, died January 16.

MARYLAND

A life-size portrait of the three physicians known as the Three Musketeers of medicine because of their close association

Continued on page 48

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Continued from page 46

for more than forty years with the staff of the Church Home and Infirmary, Baltimore. Dr. Guy L. Hunner, Dr. Thomas S. Cullen and Dr. Samuel Griffith Davis, Jr., has been placed in the waiting room of the Church Home and Infirmary. The portrait is a gift of the graduate nurses of the institution and is the work of Mrs. I. Hunner Parsons, daughter of Dr. Hunner.

Dr. Charles Reid Edwards, Professor of Clinical Surgery, University of Maryland School of Medicine, Baltimore, has been appointed Chief of Emergency Medical Service for Maryland.

Dr. Joseph Ennalls Muse, Jr., Baltimore, and Miss Anne Marie Gorman, Takoma Park, were married recently.

MISSISSIPPI

Amite County Medical Society has elected Dr. D. H. Thornhill, Crosby, President; Dr. Anderson Butler, Vice-President; and Dr. W. T. Thornhill, Crosby, Secretary-Treasurer.

DeSoto County Medical Society has elected Dr. Charles Whitley Emerson, Hernando, President; Dr. John M. Wright, Hernando, Vice-President; and Dr. Lancelot L. Minor, Memphis, Tennessee, Secretary-Treasurer.

Wilkinson County Medical Society has elected Dr. S. E. Field, Centerville, President, and Dr. R. J. Field, Centerville, Secretary-Treasurer.

A full-time Health Department was organized in Clay County with headquarters at West Point. Dr. George E. Riley, Jackson, will serve temporarily as Acting Health Officer until a permanent appointment is made.

Chickasaw County Health Department was recently organized with Dr. J. W. Dugger, Director of Division of Industrial Hygiene, Jackson, and Dr. Eva Lind Meloan directing the activities.

Dr. Victor P. Genge, Oxford, has been appointed Director of the Lafayette County Health Department, filling the vacancy caused by the resignation of Dr. T. L. Owings, who moved to Alabama to do private practice.

Dr. R. A. Brannon, Jr., who has been practicing medicine in Utica, is associated with the Mississippi State Board of Health.

Dr. Leonard D. Wright, formerly Medical Director of the Wallace Sanitarium, Memphis, Tennessee, is now Medical Director of the Welch Sanitarium, Jackson.

Dr. Alston Callahan, formerly of Vicksburg, is now associated with Dr. Murdock Equen in the Ponce de Leon Infirmary, Atlanta, Georgia, where he is directing the Eye Department.

Dr. Felix J. Underwood, Jackson, is Chairman of the Health, Welfare and Consumer Interest Division of the Mississippi Civilian Defense Council.

DEATHS

Dr. Henry Flowers, Brookhaven, aged 82, died recently.

Dr. Robert Augustus Holcomb, Hickory Flat, aged 65, died recently.

Dr. John William Long, Sallis, aged 56, died recently following a heart attack.

Dr. Ocie Rush Peek, Hickory, aged 71, died recently.

Dr. John F. Scarborough, Port Gibson, aged 61, died recently.

MISSOURI

Fifth Interstate Neuropsychiatric Institute will be held at State Hospital No. 2, St. Joseph, March 22-April 4, under the sponsoring of the American Psychiatric Association and financed in part by a grant from the Rockefeller Foundation.

American Congress on Obstetrics and Gynecology will hold its next annual meeting in St. Louis, April 6-10.

American Association of Pathologists and Bacteriologists will hold its next annual meeting in St. Louis, April 2-3.

Dallas-Hickory-Polk Counties Medical Society has elected Dr. D. C. McCraw, Bolivar, President; Dr. G. C. Plummer, Buffalo, Vice-President; and Dr. G. G. Robertson, Humansville, Secretary-Treasurer.

Cape Girardeau County Medical Society has elected Dr. Paul B. Nussbaum, Cape Girardeau, President; Dr. D. R. Seabaugh, Jackson, Vice-President; Dr. M. H. Shelby, Cape Girardeau, Secretary; and Dr. C. T. Herbert, Cape Girardeau, Treasurer.

Grundy-Daviess Counties Medical Society has elected Dr. O. R. Rooks, President; Dr. O. F. Duffy, Vice-President; and Dr. E. A. Duffy, Secretary-Treasurer, all of Trenton.

Pulaski County Medical Society has elected Dr. Cyrus Mal-

Continued on page 50

A new towel

FOR EVERY PATIENT

...AND NO LAUNDRY BILLS. Use these cotton towels once—then throw them away! Sanitary, soft, absorbent. Size 19" x 14". Made of Masslinn,* an unwoven fibrous cotton material developed by Johnson & Johnson Laboratories. You'll find many uses for these towels in the office. They're fine to give a patient who needs a towel when leaving the office. Neatly folded for convenience in handling and storage. In packages of 100 and 500.

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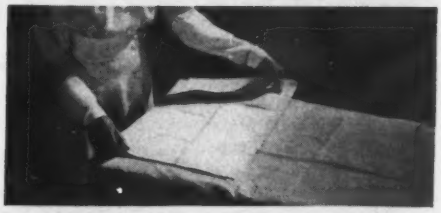
PROFESSIONAL TOWELS

Johnson & Johnson

NEW BRUNSWICK, N. J. CHICAGO, ILL.

*REG. U. S. PAT. OFF.



Continued from page 48

lette, Crocker, President; Dr. C. S. Miller, Waynesville, Vice-President; and Dr. E. A. Oliver, Richland, Secretary and Treasurer.

Ste. Genevieve County Medical Society has elected Dr. R. C. Lanning, President, and Dr. R. W. Lanning, Secretary-Treasurer, both of Ste. Genevieve.

St. Louis Surgical Society has elected Dr. O. B. Zeinert, President; Dr. M. B. Clopton, Treasurer; and Dr. J. Barrett Brown, Secretary.

Dr. Hal Foster, Kansas City, retired from active practice December 31 after sixty years of practice, fifty-nine of them spent in Kansas City. Dr. Foster presented his library to the Jackson County Medical Library.

Deaths

Dr. Edward H. Brandt, Warrenton, aged 75, died recently of cerebral embolism.

Dr. J. Park Neal, Kansas City, aged 67, died recently.

Dr. Samuel Nason Newton, Versailles, aged 66, died recently.

Dr. Winfred Bryant Post, Carthage, aged 70, died recently of coronary occlusion.

Dr. George M. Rutledge, Ste. Genevieve, aged 78, died recently of pneumonia.

NORTH CAROLINA

Forsyth County Medical Society has elected Dr. Robert R. Garvey, President; Dr. Robert L. McMillan and Dr. W. deKalb Wyie, Vice-Presidents; Dr. Carlton N. Adams, Secretary; and Dr. Howard Starling, Treasurer, all of Winston-Salem.

Halifax County Medical Society has elected Dr. Robert F. Young, Halifax, President; Dr. W. G. Suitor, Weldon, Vice-President; and Dr. W. D. Hall, Roanoke Rapids, Secretary-Treasurer.

Randolph County Medical Society has elected Dr. Tiffany Barnes, Asheboro, President; Dr. M. B. Smith, Ramseur, Vice-President; and Dr. Dennis E. Fox, Randleman, Secretary-Treasurer.

Tenth District Medical Society has elected Dr. B. E. Morgan, Asheville, President; Dr. Frank Wood, Marion, First Vice-President; Dr. L. L. Williams, Spruce Pine, Second Vice-President; Dr. J. R. Westmoreland, Canton, Third Vice-President; Dr. J. L. McElroy, Marshall, Fourth Vice-President; Dr. C. E. Hoover, Murphy, Fifth Vice-President; and Dr. D. M. McIntosh, Jr., Marion, Secretary-Treasurer, reelected.

Union County Medical Society has elected Dr. J. G. Faulk, Monroe, President; Dr. F. N. Andrews, First Vice-President; Dr. C. A. Bolt, Marshville, Second Vice-President; and Dr. W. M. Love, Monroe, Secretary.

At the Wake Forest College, Bowman Gray School of Medicine, Winston-Salem, a Department of Neurosurgery has been established. Dr. Henry G. Schwartz, Instructor in Clinical Neurologic Surgery and Instructor in Neuro-anatomy, Washington University School of Medicine, St. Louis, Missouri, has been appointed to head the new department.

Dr. Roland Bellows, Charlotte, has been certified by the American Board of Neurological Surgery.

Dr. Thomas Huffines, Asheville, has been made a Fellow of the American College of Surgeons.

Dr. William Henry Pettus, Jr., formerly Surgical Resident at Duke Hospital, Durham, has moved to Charlotte to be associated with Dr. Marvin Scruggs and Dr. L. E. Fleming in the practice of surgery.

Dr. Upshur Higginbotham has moved from Roanoke Rapids to Montgomery, West Virginia, where he will be Medical Chief of one of the local hospitals.

Dr. Philip B. Parsons, Charlotte, has moved to Norfolk, Virginia, where he will continue the practice of radiology.

Dr. L. Nelson Bell, formerly of Tsingkiangpu, China, has located at Swannannoa. He has been appointed Visiting Surgeon at the Mission, St. Joseph's and the Biltmore Hospitals in Asheville.

Dr. Roy Stinson Bighan, Jr., Charlotte, and Miss Glenna Elvin Gochenour, Charlottesville, Virginia, were married recently.

Continued on page 52

BILE ACID THERAPY

In Surgery

The hydrocholeresis produced by Decholin (chemically pure dehydrocholic acid) finds four applications which are advantageously utilized in biliary tract surgery:

(1) It causes the bile ducts to stand out more prominently at operation;

(2) It encourages maintenance of T-tube biliary drainage of an infected common duct;

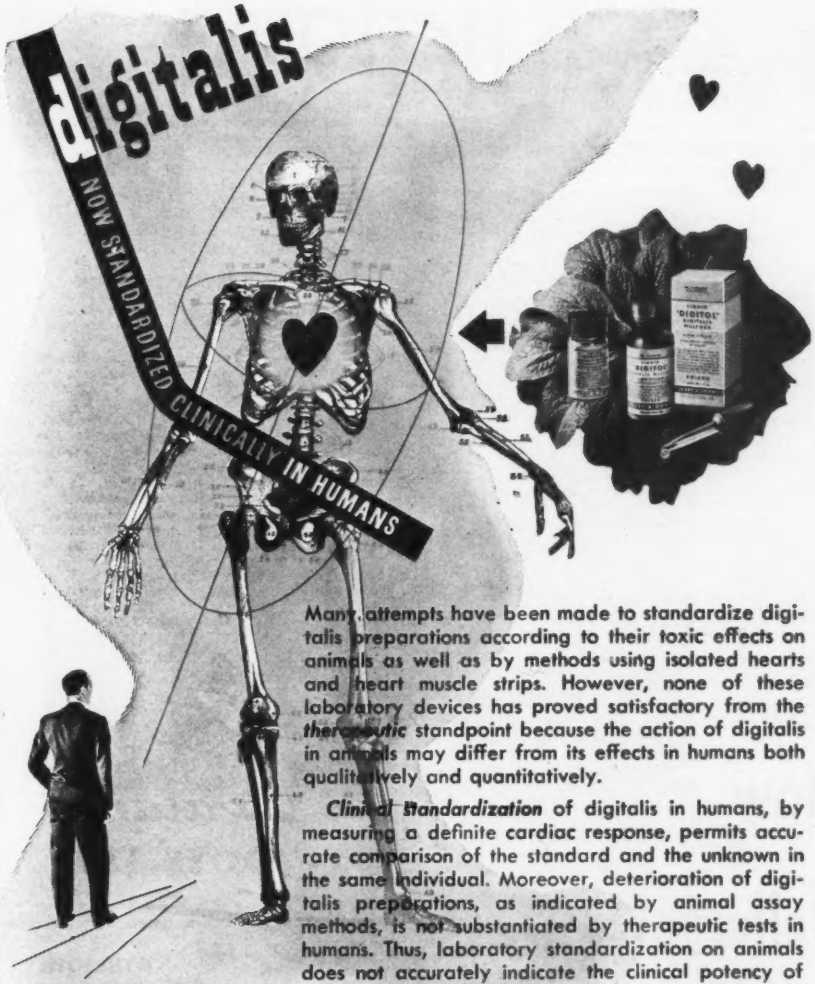
(3) It is an aid in the removal from the choledochus of small stones and foreign material overlooked at operation;

(4) In the presence of spasm of the sphincter of Oddi and in conjunction with antispasmodics, it assists in the correction of biliary dyskinesia.

Decholin and Decholin sodium are contraindicated in complete obstruction of the common or hepatic bile ducts.

Riedel - de Haen, Inc. New York, N. Y.

Decholin



Many attempts have been made to standardize digitalis preparations according to their toxic effects on animals as well as by methods using isolated hearts and heart muscle strips. However, none of these laboratory devices has proved satisfactory from the *therapeutic* standpoint because the action of digitalis in animals may differ from its effects in humans both qualitatively and quantitatively.

Clinical Standardization of digitalis in humans, by measuring a definite cardiac response, permits accurate comparison of the standard and the unknown in the same individual. Moreover, deterioration of digitalis preparations, as indicated by animal assay methods, is not substantiated by therapeutic tests in humans. Thus, laboratory standardization on animals does not accurately indicate the clinical potency of digitalis and may be responsible for variations in therapeutic activity.

Sharp & Dohme now offers to physicians ***Liquid 'Digitol' Digitalis Mulford*** and ***Tablets 'Digitol' Digitalis Mulford, standardized clinically in humans,*** as evidence of the continued efforts to make these products ***therapeutically the most practical digitalis preparations available.***

How Supplied:

Liquid 'Digitol' Digitalis Mulford—one-ounce, sealed amber bottles; each package includes a standardized dropper. Tablets 'Digitol' Digitalis Mulford—each tablet contains 1½ grains (0.10 gm.) of digitalis leaves. Bottles of 25, 100 and 1000 tablets.

Sharp & Dohme, Philadelphia

"digitol"

DIGITALIS MULFORD — CLINICALLY STANDARDIZED

Continued from page 50

Dr. Addison Gorgas Brenizer, Jr., Charlotte and Boston, Massachusetts, and Miss Meredith Ewing Marshall, Providence, Rhode Island, were married January 1.

Dr. Edwin Burtis Aycock and Miss Jean Hodges, both of Greenville, were married recently.

Deaths

Dr. Walter English Baker, Arden, aged 67, died recently.

Dr. William Earle Grady, Tryon, aged 71, died recently.

Dr. Rowland McNair Lancaster, Rural Hill, aged 55, died recently.

Dr. William Grady Smith, Wendell, aged 43, died recently.

Dr. Joseph Everett Nobles, Greenville, aged 66, died recently.

OKLAHOMA

Atoka-Coal Counties Medical Society has elected Dr. J. B. Clark, Coalgate, President; Dr. J. C. Canada, Atoka, Vice-President; and Dr. J. S. Fulton, Atoka, Secretary-Treasurer.

Garvin County Medical Society has elected Dr. T. F. Gross, Lindsay, President; Dr. A. H. Shi, Stratford, Vice-President; and Dr. John R. Callaway, Pauls Valley, Secretary-Treasurer, re-elected.

Garfield County Medical Society has elected Dr. D. S. Harris, Drummond, President; Dr. Bruce R. Hinson, Enid, Vice-President; Dr. John R. Walker, Enid, Secretary, reelected.

Jackson County Medical Society has elected Dr. J. M. Allgood, President; Dr. C. G. Spears, Vice-President; and Dr. Willard D. Holt, Secretary-Treasurer, all of Altus.

Jefferson County Medical Society has elected Dr. W. M. Browning, Waurika, President, and Dr. J. L. Hollingsworth, Waurika, Secretary.

Muskogee County Medical Society has elected Dr. Shade D. Neely, President; Dr. L. S. McAlister, Vice-President; and Dr. J. T. McInnis, Secretary-Treasurer, all of Muskogee.

Noble County Medical Society has reelected Dr. J. W. Francis, Perry, President, and Dr. C. H. Cooke, Perry, Secretary-Treasurer.

Okmulgee County Medical Society has elected Dr. J. G. Edwards, Okmulgee, President; Dr. Robert L. Alexander, Okmulgee, Vice-President; and Dr. John R. Cottrell, Henryetta, Secretary-Treasurer.

Oklahoma County Medical Association has elected Dr. R. Q. Goodwin, President; Dr. Walker Morledge, Vice-President; and Dr. W. E. Eastland, Secretary-Treasurer, all of Oklahoma City.

Ottawa County Medical Society has elected Dr. J. B. Hampton, Commerce, President; Dr. M. M. DeArman, Miami, Vice-President of the Middle District; Dr. J. R. Barry, Picher, Vice-President of the Northern District; and Dr. J. H. L. Staples, Afton, Vice-President of the Southern District; and Dr. Walter Sanger, Picher, Secretary-Treasurer.

Pittsburg County Medical Society has elected Dr. Austin R. Stough, President; Dr. Will C. Wait, Vice-President; and Dr. Edward D. Greenberger, Secretary-Treasurer, reelected, all of McAlester.

Pontotoc County Medical Society has elected Dr. R. E. Cowling, President; Dr. M. M. Webster, Vice-President; and Dr. E. R. Muntz, Secretary-Treasurer, all of Ada.

Washington-Nowata Counties Medical Society has elected Dr. Ralph W. Rucker, Bartlesville, President; Dr. R. K. Davis, Nowata, Vice-President; and Dr. J. V. Athey, Bartlesville, Secretary-Treasurer, reelected.

Woods County Medical Society has elected Dr. W. F. LaFon, Waynoka, President; Dr. C. A. Traverse, Alva, Vice-President; and Dr. O. E. Templin, Alva, Secretary-Treasurer, reelected.

Wagoner County Medical Society has elected Dr. J. H. Plunkett, President; Dr. S. R. Bates, Wagoner, Vice-President; and Dr. H. K. Riddle, Coweta, Secretary-Treasurer.

The following physicians have been granted fellowship awards by the Commonwealth Fund of New York City: Dr. Dewey Lee Mathews, Tonkawa, Medicine; Dr. Addison B. Smith, Stillwater, Surgical Diagnosis; Dr. Orville M. Woodson, Poteau, Surgery, Obstetrics and Gynecology; Dr. F. Keith Oehlschlager, Yale, Surgery and Medicine; Dr. Lee Roy Wilhite, Perkins, Medi-

Continued on page 54

Routine PYRIDIUM *Therapy*

2 tablets t. i. d. **With this conveniently administered average dosage, prompt symptomatic relief in the treatment of cystitis, pyelonephritis, prostatitis, and urethritis has been reported in authoritative published literature for more than a decade by urologists, gynecologists, and general practitioners.**

Indications

- **Pain**
- **Burning**
- **Dysuria**
- **Frequency**
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Advantages

Safety • Minimal toxicity • Ready absorbability • Elimination by the urinary tract • Analgesic to urogenital mucosa • Effective in either acid or alkaline urine • No special dietary regimen to produce effects • 1% aqueous solution for infants and young children.

PYRIDIUM
TRADE-MARK
(Phenylazo-alpha-alpha-diamino-pyridine mono-hydrochloride)

A decade of service in urogenital infections

MERCK & CO. Inc. *Manufacturing Chemists* RAHWAY, N. J.

Continued from page 52

cine, Obstetrics and Gynecology; Dr. Raymond O. Smith, Hominy, Medicine; Dr. A. C. Little, Minco, Medicine; and Dr. Ernest Rose, Sulphur, Obstetrics and Gynecology.

Dr. Lewis L. Reese, Medical Director of the State University and Crippled Children's Hospitals, resigned recently and Dr. George N. Barry was appointed Acting Medical Director.

Dr. A. M. Brewer, who has been doing postgraduate work at Johns Hopkins Hospital, has returned to Oklahoma City and reopened offices in the Perrine Building with practice limited to urology.

Dr. Lewis E. Emanuel, Chickasha, was reelected President of the Oklahoma State Hospital Association at its recent annual meeting.

Dr. Lowell L. Stokes, Okmulgee, is to be Director of a new health unit in Okmulgee County.

Deaths

Dr. Joseph Bedford Nix, Altus, aged 63, died recently of heart disease.

SOUTH CAROLINA

Allendale County Medical Society has elected Dr. W. R. Tuten, Fairfax, President; Dr. W. H. Breeland, Allendale, Vice-President; and Dr. A. B. Preacher, Allendale, Secretary-Treasurer.

Cherokee County Medical Society has elected Dr. J. N. Nesbitt, President; Dr. J. P. Thomas, Vice-President; and Dr. J. H. Cathcart, Secretary-Treasurer, all of Gaffney.

Chesterfield County Medical Society has elected Dr. J. P. Harrison, Cheraw, President; Dr. D. C. Griggs, Pageland, Vice-President; and Dr. Wm. L. Perry, Chesterfield, Secretary-Treasurer.

Greenwood County Medical Society has elected Dr. C. H. Workman, McCormick, President; Dr. W. A. Simpson, Greenwood, Vice-President; and Dr. Wm. C. Alston, Jr., Greenwood, Secretary-Treasurer.

Newberry County Medical Society has elected Dr. Hugh Senn, Newberry, President; Dr. V. A. Long, Prosperity, Vice-President; and Dr. J. C. Sease, Newberry, Secretary-Treasurer.

Oconee County Medical Society has elected Dr. G. C. Sheppard, Seneca, President; Dr. T. G. Hall, Westminster, Vice-President; and Dr. R. F. Zeigler, Seneca, Secretary-Treasurer.

Sumter County Medical Society has elected Dr. W. J. Snyder, Jr., President; Dr. N. O. Eaddy, Vice-President; and Dr. J. R. Dunn, Secretary-Treasurer, all of Sumter.

Union County Medical Society has elected Dr. A. P. McElroy, President; Dr. P. K. Switzer, Vice-President; and Dr. F. P. Salley, Secretary-Treasurer, all of Union.

York County Medical Society has elected Dr. E. E. Strong, York, President; Dr. T. N. Dulin, Clover, Vice-President; and Dr. N. G. Quantz, Rock Hill, Secretary.

Dillon County Medical Society has elected Dr. B. F. Hardy, President, and Dr. S. C. Henslee, Secretary-Treasurer, both of Dillon.

Dr. W. T. Barron, Columbia, is connected with the Urological Department of the Station Hospital at Fort Jackson.

Dr. W. L. Pressley, Due West, has been appointed Chairman of South Carolina Assignment and Procurement Service.

Dr. Samuel Eltinge Elmore, Jr., Charleston, and Miss May Carroll Mills, New Orleans, Louisiana, were married recently.

Dr. Robert Boyd Stith, Jr., Florence, and Miss Finley Plunkett, Aiken, were married recently.

Deaths

Dr. William Lamar Bryan, Jr., Columbia, aged 27, died recently of renal failure.

Dr. David Rufus Kneece, Batesburg, aged 82, died recently.

Dr. Burk McLaughlin, Dalzell, aged 76, died recently from injuries sustained in an automobile accident.

Dr. Edward Rutledge, Charleston, aged 72, died January 9.

Dr. Jesse H. Teague, aged 70, died January 5.

Continued on page 56

RADIUM *The symbol of*

PERMANENCE
RESPONSIBILITY
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Continuous possession of radium without investment at a cost of $15.00 per month for 50 milligrams, or $25.00 per month for 100 milligrams. These charges are all-inclusive. There are no extras.

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Radium in any quantity may be purchased at the lowest prices.

RADON IMPLANTS

Radon ALL-GOLD implants calibrated for time of use at $2.50 per millicurie. Implanting instruments loaned without charge.

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"—and to hasten your convalescence"

ENDOGLOBIN

with Vitamin B_1

A useful and palatable reconstructive and hematinic tonic of proven value in asthenia, anorexia, "run down" conditions and particularly in the recuperative stages of serious infectious disease or major operative procedure. Excellent for children. Contains no sugar or alcohol.

ENDOGLOBIN is composed of beef blood, iron (as iron peptonate), liver concentrate, glycerophosphate and crystalline vitamin B_1 (Thiamine Hydrochloride, 3 mgs. to the ounce).

SUPPLIED in 8 and 16 ounce bottles.

Information on request

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Continued from page 54

TENNESSEE

Anderson-Campbell Counties Medical Society has elected Dr. R. L. Gallaher, Caryville, President; Dr. G. B. Brown, Jellico, First Vice-President; Dr. A. W. Bishop, Norris, Second Vice-President; and Dr. M. L. Davis, LaFollette, Secretary-Treasurer.

Bedford County Medical Society has elected Dr. W. H. Avery, Shelbyville, President; Dr. M. L. Connell, Wartrace, Vice-President; and Dr. James N. Burch, Secretary-Treasurer, Shelbyville.

Blount County Medical Society has elected Dr. C. E. LeQuire, Maryville, President; Dr. Lea Calloway, Maryville, Vice-President; and Dr. Robert H. Haralson, Secretary-Treasurer, Maryville.

Fayette-Hardeman Counties Medical Society has elected Dr. R. L. Cobb, Bolivar, President; Dr. W. E. Martin, Western State Hospital, Vice-President; and Dr. George W. Jackson, Western State Hospital, Secretary-Treasurer.

Giles County Medical Society has elected Dr. J. U. Speer, Pulaski, President; Dr. L. A. Edmundson, Bethel, Vice-President; and Dr. T. F. Booth, Pulaski, Secretary-Treasurer.

Grundy County Medical Society has elected Dr. J. W. Clower, Winter Garden, Florida, President; Dr. W. A. Brewer, Monteagle, Vice-President; and Dr. T. F. Taylor, Monteagle, Secretary-Treasurer.

Haywood County Medical Society has elected Dr. W. D. Poston, President; Dr. Robert E. Berson, Vice-President; and Dr. Roy M. Lanier, Secretary-Treasurer, all of Brownsville.

Monroe County Medical Society has elected Dr. L. L. Barnes, President; Dr. W. J. Cameron, Vice-President; and Dr. T. M. Roberts, Secretary-Treasurer, all of Sweetwater.

Polk County Medical Society has elected Dr. W. Y. Gilliam, Copperhill, President; Dr. T. J. Hicks, Copperhill, Vice-President; and Dr. F. O. Geisler, Isabella, Secretary-Treasurer.

Putnam County Medical Society has elected Dr. Lex Dyer, President; Dr. J. F. Terry, Vice-President; and Dr. Thurman Shipley, Secretary-Treasurer, all of Cookeville.

Shelby County Medical Society has elected Dr. E. M. Holder, President; Dr. W. L. Rucks, Vice-President; Dr. A. F. Cooper, Secretary; and Dr. E. G. Kelly, Treasurer, all of Memphis.

Smith County Medical Society has elected Dr. A. O. Parker, Brush Creek, President; Dr. E. D. Gross, Chestnut Mound, Vice-President; and Dr. Thayer S. Wilson, Gordonville, Secretary-Treasurer.

White County Medical Society has elected Dr. E. B. Clark, President; Dr. C. E. Roberts, Vice-President; and Dr. B. L. Upchurch, Executive Secretary, all of Sparta.

Williamson County Medical Society has elected Dr. Harry Guffee, President; Dr. B. T. Nolen, Vice-President; and Dr. W. F. Roth, Jr., Secretary, all of Franklin.

Tennessee State Pediatric Society has elected Dr. Jack Chesney, Knoxville, President; Dr. W. D. Mims, Memphis, Vice-President; and Dr. Gilbert Eblen, Knoxville, Secretary.

Tennessee Academy of Ophthalmology and Otolaryngology has elected Dr. W. D. Stinson, Memphis, President; Dr. J. W. Wilkes, Columbia, Vice-President; and Dr. S. H. Sanders, Memphis, Secretary.

The Memphis and Shelby County Health Departments recently consolidated, the action being taken to reduce the city's budget. Dr. Lloyd M. Graves, Memphis, is Director.

Methodist Hospital, Memphis, has elected Dr. J. Harley Harris, Chief of Staff; Dr. Carey G. Bringle, Vice-Chief of Staff; and Dr. W. D. Mims, Secretary, reelected.

Continued on page 58

Classified Advertisements

RATES for insertion in the Classified Column are as follows: $2.00 minimum, which includes the first 50 words; for each word in addition to the original 50 words, the charge is 3c.

FOR SALE—Victor electrocardiograph, Model A, 1929, in operating condition. Price $125.00. Write Box 395, Parrish, Alabama.

WANTED—Two assistant residents at once, male or female, Council-approved Department of Anesthesiology. Supervised teaching in all phases of anesthesia. Must be graduate of class A medical school. Appointment for a minimum of two years, salary and full maintenance. Write Department of Anesthesiology, University Hospital, Augusta, Georgia.

POSITION WANTED—Laboratory and x-ray technician. Woman with sixteen years' experience in doctor's office and small hospitals desires position with future. Address inquiries to Dept. M-4, SOUTHERN MEDICAL JOURNAL, Birmingham, Alabama.

FOR SALE—X-Ray Unit with complete dark room equipment. Must sell immediately at a sacrifice. Located in Virginia. Owner called in Army. Address inquiries to Dept. Va.2, care SOUTHERN MEDICAL JOURNAL, Birmingham, Alabama.

SITUATION WANTED—X-Ray Technician, with many years' experience, wishes a permanent position in the South or Southwest. Details and references will be furnished on request. Please address AV-22, care SOUTHERN MEDICAL JOURNAL, Birmingham, Alabama.

FOR SALE—Attractive 10-room and 2-sleeping porch house, suitable for convalescent home. Large lot facing Halifax River. If interested, write for more particulars to Box 246, Holly Hill, Florida. This house may be seen any Saturday afternoon between two and four-thirty by calling at 1010 Riverside Drive, Holly Hill, Florida.

EDITING—Preparation of papers and reports, indexing, abstracting, bibliographies and similar services to physicians. Address inquiries to Elizabeth M. McFetridge, M.A., 4810 St. Charles Avenue, New Orleans, Louisiana.

LaMOTTE BLOOD CHEMISTRY SERVICE

LaMotte Thiocyanate Outfit

The positive chemical control of the blood thiocyanate content during administration of this compound is of the utmost importance. Analytical methods for thiocyanates have long been used in chemical laboratories, and the LaMotte outfit uses one of these procedures. The specimen of blood is treated according to instructions and the developed color in the specimen is compared with color standards. Complete outfit with instructions. Price, $22.50, f. o. b. Towson, Baltimore, Maryland.

This service includes a series of similar outfits for conducting the following accurate tests: Blood Sugar, Blood Urea, Sulfathiazole, Sulfapyridine, Sulfanilamide, Sulfaguanidine and Sulfadiazine in Blood. Icterus Index, Phenolsulphonphthalein Urine pH, Blood pH, Gastric Acidity, Calcium-Phosphorus, Blood Bromides, Blood Proteins, Urinalysis.

LaMOTTE CHEMICAL PRODUCTS CO., Dept. S, Towson, BALTIMORE, MD.

Throw Away Your Plaster Shears!

Remove Major Plaster Bandage with Hot Water

When you use Major Plaster Bandages, you say goodbye to difficult cast removal. You and your patients alike will be pleased with these strong, lightweight casts, easily bivalved or removed without hard work on your part or pain to the patient. Major Bandages are put on with cold water, removed with hot water, by your choice of two methods. Immersing or sponging the cast with hot water allows you to unwrap it as you would any bandage. Or, the cast may be bivalved by scoring it when applied, then removed as shown at the right. Order a trial supply today . . . your satisfaction is guaranteed. Packed one dozen in a tin, priced as follows:

2″ x 3 yds., doz.....$1.55 4″ x 5 yds., doz.....$2.50
3″ x 3 yds., doz..... 1.90 5″ x 5 yds., doz..... 3.00
6″ x 5 yds., doz.....$3.40

A. S. ALOE COMPANY
1831 Olive Street St. Louis, Mo.

Hot water from a syringe, applied along a scored line, makes bivalving of Major casts an easy matter.

The plaster is disintegrated by the water, leaving only the crinoline, cut with bandage scissors.

OINTMENT SPECIALISTS SINCE 1900

Having pioneered ophthalmic ointments in this country, "MESCO" today offers the profession virtually every standard formula for ophthalmology. Again "MESCO" offers the profession two of the most talked of products for ophthalmic use.

SULFANILAMIDE OINTMENT 5% List No. 64
and
SULFATHIAZOLE OINTMENT 5% List No. 65

Since their introduction to the profession in ointment form for ophthalmic use, these two products have gained steadily in general acceptance and popularity. We invite you to try these products where indicated. Also in the event you do not have our catalog, a card will bring one to you by return mail.

MANHATTAN EYE SALVE CO., INC.
1063 Bardstown Road Louisville, Kentucky

Continued from page 56

DEATHS

Dr. Archibald H. Crouch, Forbus, aged 69, died recently.

Dr. John Owen Campbell, Lebanon, aged 85, died recently of heart disease.

Dr. Samuel Earle Johnson, Nashville, aged 52, was killed during the Japanese raid on Pearl Harbor, December 7. He was Medical Inspector, Commander, U. S. Navy.

Dr. William Samuel McCormick, Arlington, aged 77, died recently.

TEXAS

Dr. Lorence W. Feller, Fredericksburg, has been named Health Officer of Gillespie County to succeed the late Dr. Joseph E. Peden, Fredericksburg.

Dr. Alexander W. Terrell, Jr., Dallas, and Miss Jeanne C. Braniff, Oklahoma City, were married recently.

DEATHS

Dr. Simm Hartt Moore, Houston, aged 55, died recently of coronary sclerosis.

Dr. Eugene Madison Parker, Houston, aged 38, died recently.

VIRGINIA

The sixteenth annual spring graduate course in Ophthalmology and Otolaryngology will be given at the Gill Memorial Eye, Ear and Throat Hospital, Roanoke, April 6-11.

Danville-Pittsylvania Academy of Medicine has elected Dr. Snowden C. Hall, Jr., President; Dr. Prentice Kinser, Jr., and Dr. E. W. Arnett, Jr., Vice-Presidents; and Dr. Charles A. Easley, Jr., Secretary-Treasurer, all of Danville.

Northampton County Medical Society has elected Dr. J. R. Hamilton, President; Dr. W. T. Green, Vice-President; and Dr. W. C. Henderson, Secretary-Treasurer, all of Nassawadox.

The Medical College of Virginia, Richmond, will begin a four-quarter schedule about the first of July in order to accelerate medical training during the war emergency, permitting students to graduate in three years. There will be no lowering of entrance requirements or of the present curriculum.

A $50,000 trust fund has been established by Amedo Obici, President of Planters Nut and Chocolate Company, Suffolk, for the erection of a hospital as a memorial to his wife, who died in 1938. The hospital is to be erected in or near Suffolk for indigents of that city and Nansemond County.

Dr. John Evan Alexander, formerly on the staff of the Gill Memorial Eye, Ear and Throat Hospital, Roanoke, has located in Evansville, Indiana.

Dr. Thomas E. Painter, formerly of Radford, has located in Pulaski and is now Chief Physician for Mason and Hanger Construction Company at Dublin.

Dr. James U. Gunter, recently at Jefferson Hospital, Roanoke, is now at the Norfolk Naval Hospital, Portsmouth.

Dr. J. Shelton Horsley, Richmond, has been appointed a member of the State Hospital Board to succeed Dr. R. Finley Gayle, Richmond.

Dr. Snowden G. Hall, Jr., Danville, has been reelected Medical Director of Hilltop Sanatorium in that city.

Dr. W. E. Roye, formerly Health Officer of the Alleghany-Botetourt Health District at Covington, has been transferred to the Tuberculosis Outpatient Service of the State Health Department's central office at Richmond.

Dr. Daniel Hope, Jr., formerly Assistant Health Officer of the Brunswick-Greeneville-Mecklenburg Health District, has been transferred as Health Officer to the Alleghany-Botetourt Health District.

Dinwiddie County has joined with Sussex-Prince George Counties as a health district under Dr. F. J. Clements, Health Officer.

Dr. William Edwin Dickerson, Danville, and Mrs. Cecil May Graeter, Richmond, were married January 3.

Dr. Joseph Page Pollard, Tappahannock, and Miss Mary Ruth Walker, Burlington, North Carolina, were married recently.

DEATHS

Dr. Robert Coalter Bryan, Richmond, aged 68, died recently.

Dr. Louise Taylor Jones, McLean, aged 63, died recently.

Dr. Harry L. Myers, Norfolk, aged 72, died January 5.

Dr. William F. Williamson, Richmond, aged 62, died January 13.

Dr. Edgar Woods, Jr., Williamsburg, aged 82, died recently of cardiovascular renal disease.

WEST VIRGINIA

Barber-Randolph-Tucker Medical Society has elected Dr. H. H. Bolton, Coketon, President; Dr. Karl J. Myers, Philippi, First Vice-President; Dr. W. L. Maxwell, Elkins, Second Vice-President; and Dr. Guy H. Michael, Belington, Secretary-Treasurer, reelected.

Preston County Medical Society has elected Dr. J. F. Lehman, Kingwood, President; Dr. R. C. Edson, Hopemont, Vice-President; and Dr. C. Y. Moser, Kingwood, Secretary-Treasurer.

Wyoming County Medical Society has elected Dr. F. H. Penn, Mullens, President; Dr. R. C. Hatfield, Oceana, First Vice-President; Dr. D. D. Wilkinson, Wyco, Second Vice-President; and Dr. J. F. Biggart, Mullens, Secretary-Treasurer.

Dr. Oscar Biern, Huntington, who has been at the Cincinnati General Hospital for the past year, will go abroad for duty in the King's Hospital in London, England.

Dr. W. W. Point, Charleston, formerly of Huntington, has been promoted to the rank of Captain in the Medical Corps of the West Virginia National Guard, now on duty at the Mexican border.

Dr. Jules I. Klein, Morgantown, and Miss Henriette Liepold, Cincinnati, Ohio, were married recently.

DEATHS

Dr. Samuel R. Holroyd, Athens, aged 74, died January 21.

Dr. Glenn Moomau, Petersburg, aged 63, died recently.

Dr. L. H. McCuskey, Moundsville, aged 71, died recently.

Dr. C. F. Sayre, Charleston, aged 53, died January 11 of a heart attack.

Dr. Jacob Schwinn, Wheeling, aged 87, died recently.

Dr. J. M. Teter, Beaver, aged 68, died recently.

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Theobromine Salicylate, a stable, well absorbed salt which strengthens the heart and at the same time lightens the load of the heart through peripheral vasodilation and through improved kidney elimination.

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Theobromine Salicylate	6 grains
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*The exceptional gastric tolerance of T C S is achieved through the addition of Calcium Salicylate which delays disintegration and solution.

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Severe rickets still occurs — even in sunny climates

Vitamin D has become such an accepted practice in infant feeding that it is easy to think that rickets has been eradicated. However, even deforming rickets is still seen, as witness the above three contemporary cases from three different sections of the United States, two of them having well above the average annual sunshine hours for the country. In no case had any antiricketic been given during the first two years of life. *It is apparent that sunlight did not prevent rickets.* In other cases of rickets, cod liver oil was given inadequately (drop dosage) and even this was continued only during the winter months.

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This highly potent source of natural vitamins A and D, if administered regularly from the first weeks of life, will not only prevent such visible stigmata of rickets as pictured above, but also many other less apparent skeletal defects that might interfere with good health. What parent would not gladly pay for this protection! And yet the average prophylactic dose of Oleum Percomorphum costs less than one cent a day. Moreover, since the dosage of this product is measured in drops, it is easy to administer Oleum Percomorphum and babies take it willingly. Thus there is assurance that vitamin D will be administered *regularly.*

Oleum Percomorphum offers not less than 60,000 vitamin A units and 8,500 vitamin D units (U.S.P.) per gram. Supplied in 10 and 50 c.c. brown bottles, also in 10-drop soluble gelatin capsules, each offering not less than 13,300 vitamin A units and 1,850 vitamin D units, in boxes of 25 and 100.

FOR GREATER ECONOMY, the 50 c.c. size of Oleum Percomorphum is now supplied with Mead's patented Vacap-Dropper. It keeps out dust, is spill-proof, unbreakable, and delivers a uniform drop. The 10 c.c. size of Oleum Percomorphum is still offered with the regulation type dropper.

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MEAD'S BREWERS YEAST POWDER • Each gram (½ teaspoon) supplies 50 International units of vitamin B_1 and 50 Sherman units of vitamin G (the same potency as Mead's Brewers Yeast Tablets), as well as nicotinic acid. Mixes readily with various vehicles the physician may specify in infant feeding. Supplied in 6-oz. bottles.

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